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EDMUND RUFFIN, EDITOR AND PROPRIETOR.

STATEMENTS OF PARTICULAR AND GENERAL MANAGEMENT AND PRODUCTS, IN FAIRFAX.

[It has not been left for us to infer, merely from the contents of the following communication, that the writer both possesses and exerts, in a high degree, the disposition and talent which are necessary to constitute a good farmer. We had heard, long ago, that Commodore Jones had rendered valuable services to his country, by improving her soil, as well as by defending it in battle. It is hoped that this first communication to the Farmers' Register from his pen, is the precursor of others; and the evidence here exhibited of value, both in working and in writing on so small a space, shows that our correspondent cannot want either a field, or fit subjects, for more extended treatment.—ED. FAR. REG.]

To the Editor of the Farmers' Register.

Prospect Hill, Va., February 16th, 1838.

Dear Sir:—Forced to take shelter in the house from the pelting storm now raging, and of course to suspend all out-door farming operations, I turned to my agricultural library, to seek in theory that which I may apply to practice, when the season for operation arrives. The January and February numbers of the Farmers' Register having just come to hand, I turned to the index, which directed me to your appeal to 'subscribers in arrear' at page 690, and after reading that article, I referred to the receipt of your collecting agent, who called on me in April last, and find that I did not then, as I had supposed, pay for the present vol. (the 5th) of the Register; consequently, I am not only indebted to you for the 5th vol., but soon shall be for the forthcoming, or sixth; to discharge which, in compliance with your terms, I send you a check on the Bank of the Metropolis at Washington, whose notes are current, I believe, all over Virginia, for ten dollars, which will square our *cash account* for a year to come. But how I, and the community at large, will ever pay the debt of gratitude we owe to the author of the 'Essay on Calcareous Manures,' and his efforts in the cause of agriculture, as displayed in the Farmers' Register, it is not easy for me to say. I feel my own indebtedness, and know not how to cancel it; for although a practical farmer for fifteen or sixteen years; although I have made "two ears of corn, and two blades of grass, to grow upon a spot of ground where only one grew before," still, from being of another profession, nothing that I could write or say would be deemed orthodox, by that class of Virginia farmers who stand most in need of new light in *practical farming*.

The subjoined statement of the treatment or management and product of a small piece of ground, being a fraction less than an acre, may be interesting to you at least; and I have now under somewhat similar treatment a good many more acres, no less productive, according to the advance in improvement. The acre here described, when taken in hand, had not for many years produced *one* barrel of corn. It is on the side of a hill, sloping to the north-west, and like most of the land adjoining me, is argillaceous; and, when ploughed deep, is retentive of moisture, but not subjecting grain to winter-killing, as many clay soils do. The surrounding country is undulating, hilly, and in some places broken; the original growth is red oak and hickory, with large white oak, yellow poplar, and some locust and walnut interspersed. When first cleared, it is fine tobacco land, and will produce five or six barrels of corn, and 12 or 15 bushels of wheat per acre for a few years, without manure, (which, until very recently, was not thought worthy of the attention of those who called themselves farmers.) But, as already observed, the land being hilly, generally ploughed shallow, *and without the least regard to the destructive consequences of washing*, the country around me presents, with some exceptions, a scene of barren hills and gullied valleys. But even these gullied hills, with good ploughing, or a single dressing of manure, become rich in the product of *grass* or *grain*, and are as easily kept so by the use of *lime*, plaster and clover, as any other lands in Virginia, *or elsewhere*, which are not alluvion, or which do not contain lime as a natural constituent.

To return then to the subject. My land was deeply ploughed, say 7 inches, in early spring of 1831. In May, sixty-two mule-cart loads of stable manure was carted on, regularly spread, and ploughed down, say 4 inches deep, and rolled with a heavy roller; in three weeks, it was cross-ploughed to the same depth, and so remained until the latter part, *say the 23d of July*, when it was again ploughed with the double-shovel plough, again rolled, and sown immediately with white Dutch and winter red top turnip seed of equal parts, and harrowed in with an iron-tooth two-horse seed-harrow. For products, and six years subsequent treatment, see the following table.

Memorandum of the culture and products of an acre of land in the County of Fairfax, for seven consecutive years.

In 1831. Produced 600 bushels of turnips, at 25 cents per bushel,	$150 00
" 1832. Oats, 72¾ bushels, sold at 45 " cents per bushel,	32 72
Stubble turned in and sowed with wheat and clover-seed in September.	
" 1833. Wheat, (lodged and did not fill well,) only 19 bushels, sold at $1 25 per bushel. Mowed the stubble in October, and got one and a half tons of cow food, worth $12,	35 75
" 1834. Clover; June cutting 3 tons, $36; September, 1½ tons, at $12,	48 00
Fallowed after 2d mowing and sowed with wheat, harrowing in *fifty bushels of quick-lime* at the same time.	
" 1835. Another bad wheat year, (blossom washed off by hard rains,) only " 22 bushels at $1 25. Mowed the " stubble in September, one and a half	

" tons of mixed hay, worth $12,	39 50
" 1836. Clover and herds' grass, 3½ tons	
" $15 per ton,	52 50
2d crop ploughed under, preparatory for corn.	
" 1837. Planted latter part of April with *Baden's twin corn*, 4 feet 2 inches each way; put a good handful of ashes, lime, and plaster of Paris combined, in each hill; product over ten barrels; say 10 at $3 50 per barrel,	35 00
	$394 27

The above land received from two to three bushels of gypsum, annually put on at various periods, but *never failing to follow the scythe with a good dressing of plaster*. Ground plaster costs from $7 to $9 per ton in Georgetown. Fresh lime, at kilns in Georgetown, in 1834, cost 15 cents per bushel; now, 12½ by the quantity. From these data, let the skeptic make any deductions he may think proper for expense of cultivation, at the highest wages for man and beast, and add interest on all cost and charges, and still there must remain a clear profit but little short of $50 per annum, from rather less than one acre of ground, which, previous to manuring in 1831, was utterly worthless, but is now considered rich. It has on it 30 flourishing young apple trees just getting into bearing, and promises a good crop of wheat seeded the last of October.

N. B. The labor I employ is slave labor. The putrescent manures are of course produced on the premises; and, with the exception of wheat and turnips, the above prices are commanded for drovers, and a relay of stage and other travelling horses which traverse the turnpike, and I get the manure gratis, besides a good rent for an* establishment which cost me about $800.

My location is just eight miles from Georgetown market-house; of course, I have a choice of the three markets of the District of Columbia, to sell or buy at, where every article which the *earth produces*, which enters into the use of man, commands, at all times, ready sale. Yet, I must tell you, that lands almost adjoining me, which pay a good *interest* on their estimated value, by sale of *wild berries*, &c. from the uncultivated fields, or from the product of dairies, where the cows depend upon the *woods* and the *commons* for a support three-fourths of the year, are rapidly depopulating, and running into barren waste, by reason of the mania, I must call it, which impels so many persons to abandon the homes of their fathers, and the enjoyment of health, comparative ease, and comfort, to seek their fortunes in the bogs and cane-brakes of the south and south-west.

When I sat down to write, I had not the least intention of thus persecuting you with a lengthy epistle, but the spirit seemed to move me, and I thought it best to give it vent; and if you cannot decypher this scrawl, you will not lose much by it, but perhaps save me some mortification hereafter.

With grateful return for what you have done, and are still doing, for the agricultural interest of the dear "old dominion," I subscribe myself your friend and servant,

THOS. AP. C. JONES.

*Illegible.---ED.

P. S. Can you not persuade Professor Rogers to take a look at this out-of-the-way corner of the state? We have many sorts of *stones* about here, (between the great and little falls of the Potomac,) and some say gold, some say lead, some coal, some copper, some have found limestone, &c. &c. &c.: but I say we abound in worn-out lands and bad farmers, who require the word of such a man as the professor, to make them set a proper value on their possessions, and the means within their reach of improving their lands.

T. A. C. J.

LIMING ON THE EASTERN SHORE OF MARYLAND.

To the Editor of the Farmers' Register.

Chestertown, Md., Feb. 17th, 1838.

* * * * *

It gives me great pleasure to have it in my power to say, that there is a great spirit of improvement amongst the farmers with us. In many places, you will see fine fields of clover, where, a few years ago, nothing but poverty grass was to be seen; and in almost every direction, now, the farmers appear to be turning their attention to the improvement of their land; and if they will only continue it, there is not much doubt but that they will be richly compensated for their trouble; for our lands are very susceptible of improvement, and with proper management, may be made to produce with any lands in the state. Within a few days past, there has been an agricultural society formed here; and if it can be conducted in the manner that we now have it in contemplation, I have no doubt but that it will be productive of much good to the farming interest.

I received a circular from you some time ago, but as it has only been within the last year or two past, that any shell marl, or green sand, has been carried out on our lands, I have been unable to get hold of any information which would enable me to give you any satisfactory answer to the queries it contained. As soon as there has been sufficient time to test the value of them, I will let you hear from me.

For several years past, many of the farmers of this county have been using the shell lime with great success. It has been used in various quantities, from 100 to upwards of 200 bushels per acre. The quantity depends upon the condition that the land was in. Where it was thin, it has been deemed advisable to give it a light dressing at first. There is a great difference of opinion with regard to the manner in which lime should be applied; some contending that it is better to spread it in the fall, on the land that is to go in corn the following spring; others, that it is better to apply it in the spring, after the ground had been broken up. For many years past, I have been using the shell lime with great effect, and have generally applied it in the spring, after the ground has been ploughed and the corn planted. I have been in the habit of carrying out, in the spring, the manure that was made in the farm-yard through the winter, and after having it put in the furrow, and the ground listed and ploughed out, I have had a shovel full of lime spread over the ridge from corn-hill to corn-

hill; and if the season was tolerably good, have hardly ever failed to make a good crop of both wheat and corn, from land that was very thin before the application of the lime and manure. A part of the field that I had in cultivation on my farm in this county, in the year 1836, was land that, on account of its barrenness, had not been in cultivation for 8 or 10 years before, and when it was ploughed, it was covered with poverty grass. This piece of land, I treated in the following manner, viz.: In the spring, I had the manure, that was made in the farm-yard through the winter, carried out on it, and after having it put in the furrow, and the ground listed and ploughed out, (which was done as soon as the manure was spread,) and the corn had been planted, I had a shovel full of lime spread on the ridge from corn-hill to corn-hill. Shortly after, I used the large drag harrow, which appeared to mix the lime pretty well with the earth. In consequence of the heavy rains that we had in the months of May and June, and it being rather low stiff land, I was unable to give the corn the usual cultivation, and made little or none from it. In the fall of the year, it was seeded in wheat, and the spring following, clover was seeded on it. This piece of ground yielded me from 18 to 10 bushels of wheat to the acre, each bushel weighing 60 lbs.; and when the wheat was cut, the clover, that had been seeded in the spring, was about a foot high, as thick as I could have desired it, and the greater part in blossom. This fine growth of wheat and clover, I attribute in a great measure to the lime, for I have frequently tried the same kind of manure without the lime, and have never discovered much benefit from it. On my farm in Queen Ann's county, which is rather a light soil, I have been using the shell lime ever since the year 1822, and have generally applied it in the spring, after the ground has been ploughed, and it has always acted very finely. In the year 1828, I limed a piece of land, in one of the fields on this farm, which was covered with sorrel and poverty-grass. It did not appear to have any effect upon the corn crop, but the effect was very visible upon the wheat, which followed the corn; and after the wheat was taken off a fine growth of white clover come up in the place of the poverty-grass and sorrel, and ever since it has been producing fine crops, without the aid of any other manure. I am decidedly of the opinion, that it is better to apply the lime after the ground is broken up; for in this way, you keep it near the surface, and it also becomes more immediately and better incorporated with the earth; both of which, I think, are very desirable. The farmers are becoming sensible of the great importance of lime, and are very generally getting into the use of it.

GEO. S. HOLLYDAY.

From the Medico-Chirurgical Review.

THE RAIL ROAD STEAMER.

By James Johnston, M. D.

Were any of the ancients to rise from their tombs, and to behold a steam-ship, full of passengers, darting up the Thames, or a train of carriages, with a thousand people, flying along a rail road at the rate of 30 miles an hour, they would be very apt to doubt the fact of their revisit to the same planet they had left—since a thousand years in the grave may probably seem no longer than a short siesta after dinner. Their surprise would not be much lessened by the sight of a column of brilliant flame springing up from the middle of a street, or issuing from ten thousand metallic tubes, and turning the darkness of night into the glare of day! If, while gazing at these phenomena, they saw a man, or even a monkey, descend from the clouds, suspended as the pendulum of a huge umbrella, they would no longer doubt that they had got into "another, if not a better world," than that of their birth and death!

But to return to the *rail road steamer*. Without rudder or rein; without tug or tow-rope; without chart or compass; without impulse from *man*, or traction from *beast*—this maximum of power in minimum of space—this magic *automaton*, darts forward, on iron pinion, like an arrow from a bow, along its destined course. Devised by science, but devoted to industry; harmless as the dove, if unopposed; but fatal as the thunderbolt, if obstructed in its career; this astonishing offspring of human invention; this giant in strength, though a dwarf in stature, drags along, and apparently without effort, whole cargoes of commerce; merchants and their merchandize, artizans and their arts, travellers and their traffic, tourists and their tours (some of them *heavy* enough)—in short, every thing that can be chained to the tail of this herculean velocipede!

The steam-carriage nearly annihilates distance between the inhabitants of a state, and thereby converts, as it were, a whole country into a city, securing all the good effects of combination and concentration, without the detrimental consequences of a crowded population. By the rail road, Liverpool, Manchester, Birmingham, and the Metropolis, are constituted *contiguous* cities, while wide and fertile tracts of country intervene! Thus *steam* multiplies the products of human labor, by increasing their sale and diminishing their price. It will enable us to convert millions of acres from pasturage into cornfields, and consequently the provender of horses into food for man.

The whole transit of a *rail road steamer* is a series of miracles, which, in former days, would have been attributed to angels or demons. At starting, the mighty automaton suddenly suppresses his torrent of hissing steam, and belches forth a deep and hollow cough, which is reiterated at shorter and shorter periods, like a huge animal panting for breath, as the engine, with its train, labors up the ascent from Euston square. These belchings more nearly resemble the pantings of a lion or tiger than any other sound that I know of. With the slow motion, on any considerable ascent, the breathing of the animated machine appears to become more laborious, and the explosions more distinct, till at length the animal seems exhausted, and groans, as it were, under the tremendous effort. But the engine, having mastered the difficulty, acquires velocity before it plunges into the dark abyss of the tunnel under Primrose-hill. There the peal of thunder; the sudden immersion in cimmerian darkness; the clash of reverberated sounds in confined space; the atmospheric chill that rushes over the frame; all combine to induce a momentary shudder at the thought of some possible collison or catastrophe in this subterranean transit, which is increased rather than diminished

by the gleams of dubious light that occasionally break in from above, or the sparks of fire that issue every instant from the chimney, rendering "darkness visible." On emerging from the gloomy and gelid cavern, every thing appears of dazzling brightness, and we breathe with delight the pure atmosphere of heaven.

The moment the highest point of elevation on any part of the road is gained, and a descent commences, the engine, with its long train, starts off with augmenting velocity, dashing along, like lightning, and with an uniform growl, or roar, like a continuous discharge of distant artillery or thunder. The scene is now grand—I had almost said terrific. Although it may be a complete calm, the wind appears like a hurricane; and, while the train is flying along the raised embankments, as near Watford, it is impossible not to feel some sense of danger, or an apprehension that some unexpected impediment may hurl the whole cavalcade into the yawning gulf below!

The meetings of the trains flying in opposite directions [on double tracks] are scarcely less agitating to the nerves than the transits through the tunnels. The velocity of their course—the propinquity, or apparent identity of the iron trajets along which these hissing meteors move, raise the involuntary but frightful thought of a possible collision, with all its horrible consequences! The period of suspense, however, is but momentary. An electrifying concussion, as it were, of sense, sight, and sound takes place, and, in a few seconds, the object of terror is out of view behind.

But such herculean labor cannot be carried on in so small a compass, without great expenditure. The *automaton* thirsts; he knows the places of refreshment; utters a loud and piercing whistle or note of preparation; slackens his pace; halts at the fountain, and ingurgiates a deluge of water to quench his burning drought. In five minutes he is able to renew his gigantic task!

The steam shriek is a new phenomenon on the rail road, and a very startling one it is. By opening a small valve in the boiler, a volume of steam is driven, with tremendous force and velocity, through a narrow aperture, in imitation of a throat, causing a shrill shriek, unlike the voice of man, or of any known animal, but so loud as to be heard two miles off. It is a most unearthly yell, or scream, or whistle; which was compared by a distinguished poet, who sat beside me,* to the cry of some monstrous animal while being gored to death. It forms an excellent alarum, to clear the road for the train, and apprise those at the stations, that the engine approaches.

The rail road travelling possesses many peculiarities, as well as advantages, over the common modes of conveyance. The velocity with which the train moves through the air is very refreshing, even in the hottest weather, where the run is for some miles. The vibratory, or rather oscillatory motion communicated to the human frame, is very different from the swinging and jolting motions of the stage coach, and is productive of more salutary effects. It equalizes the circulation, promotes digestion, tranquilizes the nerves (after the open country is gained,) and often causes sound sleep during the succeeding night, the exercise of this kind of travelling being unaccompanied by that lassitude, aching, and fatigue which, in weakly constitutions, prevents the nightly repose. The rail road bids fair to be a powerful remedial agent in many ailments to which the metropolitan and civic inhabitants are subject.

To those who are curious, and not very timid, the open carriages are far preferable to the closed ones, especially in fine weather. In bad weather, and particularly at first, invalids may travel with more advantage under cover, I have no doubt that to thousands and tens of thousands of valetudinarians in this overgrown Babylon, the run to Boxmoor, or Tring and back, twice or thrice a week, will prove a means of preserving health and prolonging life, more powerful than all the drugs in Apothecaries' Hall.

In fine, a man may travel from the pole to the equator—

"A Gadibus usque ad Gangem"—

without seeing any thing half so astonishing as the wonders of the rail road. The pangs of Etna, and the convulsions of the elements excite feelings of horror and terror, without any thing of pride. The magic—the miracles of the rail road, engender an exulting consciousness of superiority in the genius of man, more intense and conclusive than any effort of poet, painter, or philosopher.

The rail road journey, however, is not without its inconveniences, many of which may be prevented by a little ingenuity. The greatest is the discharge of cinders, some of them ignited, from the chimney, which are not only disagreeable, but occasionally dangerous to the eyes of those in the open carriages. This might be prevented by an awning—a protection which is adopted on some rail roads, and one that must ultimately be adopted on all. It is a protection from the elements of fire and water, which every company is bound to afford to the passengers, and is attended with trifling expense. Till then, glasses or a veil are necessary guards for the eyes.

The transits of the tunnels, in hot weather, causing a sudden vicissitude of temperature, to the extent of 20 degrees of the thermometer, or thereabouts, require some precaution on the part of sensitive invalids. A shawl or large handkerchief, thrown over the head, is a sufficient protection, and those who do not take this measure, should keep their eyes shut, during the passage, since sparks and cinders are, unavoidably, thrown in closer showers over the passengers here than in the open space.

To speculate on the normal, physical, political, and economical effects and consequences of rail roads and steam navigation, when carried to their full extent, is beyond my province—perhaps beyond the bounds of human foresight. If the semi-civilized peasants of the remotest isles of the Hebrides, of Orkney, and of Shetland, can even now, transmit, in a few hours, the produce of their huts, their mountains, their moors, and their farm-yards, to the markets of Glasgow and Edinburgh, so as, in three or four days, to pay the annual rents of their tenements and wildernesses, what may we not expect from the extension and perfection of this facility of intercommunication? In days of yore, the imponderable products of the intellect travelled as slowly as the material merchandize of mankind. They will now be diffused, from the centre to the periphery—from the remo-

* Campbell.

est outlines to the foci of society, with a rapidity little less than that of *thought* itself! ! The ultimate *consequences* cannot be appreciated at present; but we may safely conclude that the benevolent author of our existence did not endow the mind of *man* with such extraordinary powers of invention, without the *design* of final advantage to his physical wants, his social relations, and his spiritual nature.

THE TRADE FROM THE WEST, BY THE JAMES RIVER AND KANAWHA IMPROVEMENT.

Extract from the Report of the Chief Engineer, Charles Ellett esq., to the late General Meeting of the Company.

It is not my intention to indulge at this time in any general reflections on the probable result and prospective advantages of the improvement. Indeed it would be as unnecessary as it would be difficult, to attempt an examination of all the influences which a work of this nature exercises over the prosperity of a state. It would be to trace the consequences of a general diffusion of wealth and commercial prosperity through every department of business and every branch of trade. If we were anxious, we might arrive at a more accurate and useful result, by considering the present consequences of a stoppage of some great work in active operation—as, for instance, the Erie canal of New York; by reflecting on the consequences to the emporium of that state, and to her agricultural, manufacturing and mercantile interests, of cutting off the eight hundred thousands tons of produce and merchandise that annually pass through it; of destroying the improvement that created the line of towns and cities from Buffalo to Albany, and that forces every cultivated acre north of the Ohio and east of the Mississippi to contribute to the growth of her wealth and power.

During the last year a breach occurred on the long level of that work, and the New York papers informed us that before it was repaired *seven miles of canal boats* collected near the adjacent locks. And now to stop the Erie canal would be more withering to her prosperity than to close up the "Narrows" which admits her foreign commerce, and more fatal to her advancement than any misfortune she could experience, excepting the loss of the energy and enterprise of her population.

I am sensible that there are those who are sufficiently aware of the importance of that work to the state by which it was made, and who can appreciate the consequences of its destruction, but who are disposed to doubt whether the James river improvement can be regarded as an analogous project. These will admit, what is undeniable—that a considerable portion of the country traversed by the latter work is quite as fertile as that which contributes to the trade of the former, and that its mineral wealth is incomparably greater; but, by over-estimating the influence of the lake trade on the tolls of that improvement, are brought to a false comparison.

Notwithstanding the rapid and unparalleled progress of internal improvements in this country, our minds are still embarrassed by the mode of considering the subject applicable to prominent European examples. Works having there been long in successful operation, furnished us with the facts which were originally employed by the advocates of similar enterprises in this country; and it is not easy to change a habit of thinking which has been long established, and to which the mind has become attached by the indulgence.

But when we estimate the probable consequences, and value of an improvement adapted to the peculiar condition and grand divisions of this country, we must view the subject in an aspect different from that of a work connecting two lakes or towns, where the trade already is, and where the consequences of their connexion may be determined from existing facts. Here things are different; the improvement creates the trade, and the trade which it creates supports the work that brought it into existence. The value of a work here depends on the place *to* which it reaches but in a secondary degree; the primary considerations being, nearly always, the character of the soil *through* which it passes, and the length of the line of the improvement.

The Erie canal is not supported by the trade of the lakes; and until the last year, the influence of that trade on the revenue of the work was hardly appreciable.

In 1835, when that line paid into the treasury of New York nearly one million three hundred thousands dollars, the tonnage of western produce coming from other states to Buffalo, and that passing up the canal to the lake, *was but six per cent.* of the whole tonnage constituting the trade of the work. The residue—namely, the 94 per cent.—was made up along the line of the canal itself, and consisted of the produce of farms which were chiefly brought into cultivation by the improvement of the forests to which it became the out-let, of the mines which owe to it their value, and of the supplies of towns and cities on its banks, the very foundations of many of which were laid after the commencement of the construction of the work.

I by no means desire to depreciate the value of that western trade, which, notwithstanding its present inferiority, I regard as by far the most important of the prospective resources of the line, and the city which it sustains. The increase of its value in one year—the last year—was 71 per cent. over that of the preceding, and there is every reason to believe that the rate of its increase will continue to be progressive. The great country surrounding the lakes and the tributaries of the Ohio has but begun ro receive the population which it is capable of sustaining, and has hardly begun to send off the surplus produce which is not required for the supply of the emigrants.

The hundred thousands persons who annually go westward by the packets on the Erie canal, and the unestimated thousands who cross the Alleghany by some other route, are almost lost in the forests and prairies. They are now but seeding the ground; and we may ask in admiration, what will be the effect of the Erie canal ten years hence, when the country is in some measure populated, and the reaping shall commence—and the splendid schemes of improvement now in contemplation or in progress, leading from the interior of Ohio, Indiana, Illinois, Michigan and Canada, have begun to pour the produce of those states, destined for the city of New York, into the lakes?

The trade of the Ohio, which is one of the ob-

jects sought by the improvement we have on hand, is not less important. Its tributaries, and those of the stream of which it is a tributary, spread over a still wider area, and penetrate a still richer country. The number of steamboats, which may be regarded as the measure of the trade, is many times more numerous, and increasing far more rapidly than the number of those on the lakes.

The Pennsylvania improvement last year, though operating under most unfavorable circumstances, and in only the third year of its existence, carried to and from Pittsburg, over the ten inclined planes and broken line, a quantity of goods and produce exceeding by a vast amount that which circulated between New York and Buffalo.

And this line through Pennsylvania, from the Ohio to tide water, is open and successful. This is not the time to draw a comparison between that work and the one which we are constructing; but they who are disposed to doubt the success of the James river and Kanawha improvement, or its ability to bring the trade of the Ohio to Richmond, and forward supplies to the west, would do well to examine the list of articles transported on that line. Perhaps they will find in the fact, that there were carried from Pittsburg to Philadelphia, the last year, more than *one million four hundred thousand* bushels of wheat, and *three hundred and thirty thousand* bushels of corn; and towards Pittsburg from Philadelphia and the intermediate places, *twenty thousand tons* of merchandize, and *nine thousand tons* of groceries; an argument worthy of their consideration.

Though these articles are among the most important carried on the line, they constitute but a small portion of the aggregate tonnage.

What will be the amount carried on the James and Kanawha improvement, or what influence the superiority of its termination on the Ohio, and the advantage of its climate may have on its success, we may leave for the event to determine, and for a rational public to anticipate. As things are, it remains but for this company to go on as they are going—to expend their present capital to the best advantage—and trust to the evidence which the works they finish will afford, and that perseverance to which they owe their present existence, for raising the balance.

THE NECESSITY FOR GREAT CARE, AND JUDGMENT, IN SELECTING STONE FOR LOCKS, AQUEDUCTS, AND OTHER PUBLIC WORKS.

Extract from the Proceedings of the James River and Kanawha Company.

To the President and Directors of the James River and Kanawha Company.

Gentlemen—the chief engineer has permittted me to peruse his report of the 19th instant, on the subject of a change of plan, by the substitution of wooden locks for stone, as a temporary measure, which was referred to him and myself by the board in October last.

By this report, it appears that the saving of outlay in the first instance, is about 8000 dollars per lock, and the real loss on a final result, about 370 dollars per lock. This view of the change is quite as favorable on the side of the stone locks as I could make it.

It is well known, that from a point a little above the Rivanna river to the Blue Ridge, along the valley of James river, or in the vicinity of it, there has not been found any stone fit for locks, with two or three exceptions—and these exceptions only gave stone of bad shape, and which worked into locks with great expense.

I have just returned from a visit along the Erie canal; and an examination of the locks (built 16 to 19 years past, of stone, which was then thought by all who examined them to be good,) has proved that we ought to be very particular in our selections of stone for locks or aqueducts. In many of those locks I now refer to, the stones have scaled off on the face, and become decomposed, so as to require blanking to keep them up, until new locks can be erected; and so particular are the board of commissioners of that canal, in their selection of stone for new locks, that they are transporting stone from 50 to 120 miles on the canal to build locks and aqueducts.

The aqueduct over Genesee river, consisting of nine or ten arches, of 50 feet chord each, was built of stone, which was approved at the time, and found in the quarries in the vicinity; they have failed entirely, and a new aqueduct is now building with stone brought 120 miles.

The masonry of a lock is the most trying and severe test in which stone can be placed—and the greatest care and caution should be taken in selecting them.

I believe it will be found, that by erecting wooden locks, and placing them on the hill side of the canal, so as to build a stone lock in its proper place next the towing path, and by taking time to select good stone, from a quarry near the canal, and of a quality that will come out with good parallel beds, and cut well, a lock can be built of such stone when brought 100 to 150 miles on the canal, cheaper than the locks can now be erected. And I add to this, that in the choice of good stone and good cement, and selected mechanics, it is probable the real worth of the lock would be double the value of such as we should be obliged to build, if we persist in the construction of stone locks now, under all disadvantages.

I passed through the Pennsylvania canal, between Pittsburg and Harrisburg, in June last—and found three fourths of their locks were wood, backed up with dry walls. These, I believe, are intended to be permanent, and to be repaired from time to time as the wood decays, which can be done in winter.

Taking a view of all the bearings of the question referred to the chief engineer and myself, I concur with him in recommending the wooden locks; and I would advise the board to have a model made of one inch to the foot, representing every piece of timber, and the manner it is put together—so that contractors cannot mistake the intention of the board, and may understand their own proposals.

Respectfully submitted.

BENJ. WRIGHT,
Consulting Engineer.

Richmond, Nov. 27, 1837.

For the Farmers' Register.

THE LAWS OF SUBSISTENCE AND OCCUPATION CONSIDERED, IN RELATION TO THE AGRICULTURAL IMPROVEMENT AND GENERAL WELFARE OF THE COUNTRY.

Of all the errors, (and there are many and grievous ones,) in the present system of political economy, there is none so great, and utterly fallacious and mischievous, as that of viewing manual operative *human* labor, as a mere dead or barter commodity; as if *its* compensation, value and demand, were merely regulated and required only by the wants of the few rich; as if *its consumption*, although forming the *mass* of mankind, had nothing whatever to do with the means, power and purpose of all human exertion and industry, existence and subsistence: just as if the few rich *choose* to *demand* it—very well; and if they do not, it must suffer and abide !!! and the rich receive no injury ! !

In thus considering that three-fourths of mankind, and more, are not *men*, nothing can more lamentably show the withering, blasting effects of *aristocratic* feelings and principles; for *this* is the foundation of it all. The earth was created for the use of *man*, without any regard to any distinctions of wealth or poverty, manual or intellectual labor, size or color. In one respect, all are upon a perfect equality—*the stomach;* as this is filled, so are nations prosperous and advancing, or poor and declining. If the rich man has his venison, turtle, canvass-back ducks, wood-cock and asparagus, the operative *must have*, and with equal if not superior enjoyment, his fat beef, pork and mutton, bread, cabbage and potatoes. No *individual* can be cheated out of and deprived of his *natural* rights, without a corresponding loss to *all*. Feed the *mass* upon rice, indian corn, potatoes and dry bread, and what is the result?—the utter stagnation of agriculture; no flocks and herds to maintain, create and increase the fertility of the soil, and with the consequent due economy; no price, for there is no demand to justify improvement, no means to accomplish it; all is stagnant and dead, destructive and impoverishing. If agriculture is drooping and dead, what profession is alive and flourishing? None. Agriculture is the foundation of all prosperity, and its prosperity depends upon all men being able to subsist according to the natural law of subsistence. Set the people to work according to the law of occupation, that is, every one being employed according to his *natural* taste, capacity, and power, and then all will have the means of legitimate subsistence; food will then be produced according to the law of man's subsistence, and the consequent and attendant true principles of agriculture, and all will flourish together; deficiency of food and excess of population, will then be things to be talked of as occurrences gone by. Yet political economists seem to consider low wages and excess of population, as evils of the people's own making, and of which they alone are the sufferers; and hence the Malthusian theory of "moral restraint," for their exclusive practice and benefit! How ignorant was the founder of that wretched system of the true system of the laws of the occupation and subsistence of man, and of the production of his food!

Nothing is plainer and more obvious, to me at least, (and the world will understand it too, by-and-bye, to its immense advantage,) than that the *power and means* of the production of food, are in exact proportion to the *nature* and *extent* of consumption; the true law of the production of food, being in exact accordance with the law of *man's legitimate* subsistence. That if he subsists upon bread or potatoes, or rice or hominy, or animal food alone, which nature did not form him to do, just so are his means of procuring subsistence curtailed, with increase of population; but as he subsists upon animal and vegetable food in certain proportions, and upon all their varieties, as he was obviously organized to do, exactly and duly, so are the power and means of increasing his means of subsistence, with increase of population.

This is certainly a more comfortable doctrine than that of Malthus; that most hideous, blasphemous and atheistical of all theories ever broached by ignorant man; but not intentionally so; but it is founded upon the most consummate ignorance of first *principles*, and utter ignorance of any knowledge whatever of agriculture, grafted upon narrow, exclusive, aristocratic habits, actions and principles of thinking. Audacious and presumptuous man! professing, too, to be a teacher and follower of the doctrines of him "who condescended to assume the garb of a Galilean peasant;" did you believe that all this world's productions were made exclusively for the few, and not for *man*? Did you believe that the producers of them were only to have a mere existence? although the physical organization of all is identically the same as to subsistence. Did you discover any difference between the teeth, palate and stomach of the noble, the country-gentleman, the rich merchant, and the mechanic or cultivator of the soil? No; they are all in *this* respect the same. The rich man may have his beef, mutton and pork—venison, turtle and wood-cock—bread, potatoes and cauliflower, &c. Nature has evidently so ordained it. But the laborer cannot be pushed from the board of beef, mutton, pork, bread and potatoes, and many other necessaries, luxuries and comforts, with impunity. Nature has ordained this too. Man must have his *natural* rights, or the board, and all that is upon it and *about it*, will ultimately disappear together. The silent wrecks of the fraudful monopolizing exclusive system, are visible in every quarter of the globe. They are true and unerring land-marks, to guide us and many future ages, if we will only read them aright. But it is not the "cloistered philosophers," the "elegant historians" or the dillettante tourists, that are the men to do this. It must be done by men who have lived, worked, and fed with men; and these will tell the world, man cannot be cheated out of his natural rights, as man, with impunity.

It is very remarkable, that Malthus never once inquires—"Have nations fulfilled their duties so as to obtain the means of subsistence?" Nothing can explain this but his utter ignorance of the laws of occupation, subsistence, and the production of food, and their operations and effects on the one hand, and his strong political bias on the other. Such a man ought not to have written upon *this* greatest and most important of all questions. It was deeply criminal. No man ought to write upon it, who is not prepared to see, feel and understand, that *all* men are *men* equally with himself; he must be prepared to do his duty to himself and society, and at the same time believe that all other men are *formed* to do that duty to themselves,

to each other, and to him; that they are *formed* to subsist as he subsists; and that they are to be occupied in their various callings, free and unshackled, as he is occupied; to obtain their legitimate subsistence as he obtains his: he will then probably come at something like the truth; but never with the ignorance (of first principles) and the political feelings of Malthus. Malthus has written a glorious book for the selfish—(forced to be by law) idle, rich, and titled; of course *they* cried up his monstrous, outrageous, and really blasphemous theory, as a master-piece of philosophy! To make the scorn and usurped superiority of the adventitious aristocrat a fixed and satisfied principle, is an act of fearful error and mischief.

The besetting fault, and the true cause of the utter fallacy and consequent complete failure of the operation of the laws and theories of statesmen, political economists, philosophers, philanthropists, &c. are in their viewing, partial and local things, as the sole and main causes of great and universal evils; and partial and local remedies, as the great and universal ones. Consequently, their remedies are ever in direct variance with the greatest and most important laws of nature; hence they cannot succeed. Deficiency of food and excess of population, affect the condition of *all;* they arise from the ignorance and errors of *all;* they must be removed and remedied by the just observance of the laws of nature by *all.* How then can *partially* checking population in *one* class, remedy the existence of universal deficiency of food and excess of population, when all are placed in utter disproportion of the law of occupation, and the mass with that of subsistence?—thus, all making the production of food for the mass defective and deficient. If the whole *non*, undue, disproportional and defective observance of the law of occupation, makes the production of food deficient, how then can any *partial* and *arbitrary* check to population, even if practicable, possibly remedy the evil, leaving the real causes still in full operation as before?

The production of population belongs to the laws of nature; man has nothing to do with either checking or regulating its increase, or otherwise. The more he does so, the more mischief he will create. His duties are to provide due and sufficient occupation; the food will then duly follow the consequent full and legitimate demand, and consequent just compensation (wages) for it. The power to do so being *then* fully equal to the force and extent of the demand, for as is the demand for food, so are the powers and means of creating it. Who can doubt that the laws of nature are in any degree inadequate to this purpose!

It is well put by H. C. Carey in his 'Essay on Wages,' that "the trade of population is the only one that has heretofore been free; and it is to be regretted, that those who are in favor of loosing the shackles which have bound all others, advocate restrictions upon that which has heretofore escaped." If the trade of population has always been free—and God forbid it should ever be (morally and legitimately) otherwise--well may there be deficiency of food and excess of population, whilst nations are restricted in all sorts of ways, both as to their natural subsistence and occupation! *Let population alone; duly and justly employ it; and it will then be duly fed.* If it is thus duly fed, the production of food will then be full and ample. Deficiency of food and excess of population, will then wholly cease and disappear. *Let* rich and poor marry as they may. All this, political economists and statesmen, and even farmers and manufacturers, have yet to learn and understand. If they do not know these (when known) very simple and very obvious *first* principles. what errors they must commit! Not knowing them, they have done so.

Malthus has clearly and most indisputably proved (with some facts innocently, because ignorantly, somewhat stretched as part of his theory,) that deficiency of food and consequent excess of population, poverty and misery have existed in all ages and countries: thus opening the door to the investigation of the greatest and most important subject which ever did or can engage the mind of man. But surely the cause cannot be what he has conceived it to be, and still less the remedy. He says man has a *tendency* to increase faster than his food; so have all living things, animal and vegetable, from the musquito to the elephant, from the thistle to the oak, the same *tendency.* If animals have a tendency to increase faster than plants, (if I may so express it in a sort of Irish fashion for want of a better,) plants have the same tendency to increase faster than animals. The shark has a tendency to depopulate the ocean; the herring has a tendency to fill it. The lion and tiger, the thistle and thousands of other plants and weeds, little things as well as great, have a tendency to drive man out of existence. Yet all these things remain as duly proportioned as ever. We *know* the sun and other forces are adequate to sustain, light and heat the globe itself, and therefore we *may know* that there are other laws, although we may not yet have discovered and brought them into action, equally and correspondingly, adequate to duly and fully support *human* life. Nature has equalized and adjusted all these things so exactly and truly, that there is nothing either to excite man's fears regarding them, or to require any *interference* of his to regulate them, or to make any *new laws* respecting them.

I believe no one has yet investigated the question and principles of how the *occupations* of a nation govern the means and modes of subsistence, and of how the powers and modes of subsistence govern the production of food.

The great essential means of the prosperity and well-being of mankind, are the due observance of the law of occupation. All being duly occupied, they will be duly paid, and consequently, duly subsisted; the true principles and practice of agriculture will then consequently follow. With these, education must go hand in hand; and to establish these, there must be good government. If these laws are not duly observed and established, how nugatory must be all compulsory laws of government, directing and controlling the people! And how unnecessary, if they are observed and established!

Every man is born with certain powers and abilities to enable him, not only fully to support his own existence, but likewise that of his children; that is, provided all other men duly exercise their powers and abilities, and all duly and equitably exchange the products of their labors with each other. If the sexes, rates of increase, kinds and quantities of food, animals, plants, fishes, birds, land and water, heat and light, seasons, *every thing*

—are all duly and exactly proportioned to each other, surely the natural tastes and abilities of all *human* individuals, are as justly and equally proportioned to each other, so as to duly, fully, exactly, and proportionately, supply each other's wants. Whether a certain piece or kind of timber, or a certain other piece or kind, is made into a table, a chair, a box, or a coffin, or something else, or any thing else, *may* be of no sort of consequence; but not so whether a *man* is *made* a ditcher or an idle lacquey, whom nature intended to have been a blacksmith or a carpenter; or is made a farmer, who ought to have been a cotton-spinner: or is made a clergyman, who ought to have been a butcher; or a lawyer or physician, who ought to have been a drayman; or is *made and forced to be a lord*, whom nature intended for a stage-coachman or ostler; or who is made a beggar and convict, who ought to have been a secretary of state; and so on with all others out of their places, and in no places.

No man can ever be truly happy, virtuous, industrious, healthy in body and mind, and in all things truly right and securely and fully successful in life, who is out of the place or profession assigned him by his *natural* tastes, capacity, and powers. How wrong, then, are all artificial distinctions, privileges and powers, slavery, &c.! It is this which causes excess of population, keeps wages below the power of the observance of the law of subsistence, consequently depresses agriculture to the lowest possible condition. Slavery makes nations poor, stationary and retrograde, because it makes the different classes to supply each other's wants so unduly disproportioned to each other. *It is this disproportion*, which is the real source and immediate cause of all the poverty, idleness, and consequent misery, and crime of Ireland.

Were all placed in their natural and legitimate stations, violent revulsions in trade could never occur, and bankruptcies very rarely; "competition" in trade, the curse of society and the destruction of honesty, integrity and fair dealing, could have no existence. Trade, commerce, the law, medicine, and the church, &c. are called very uncertain and precarious professions; and why? They are not inherently so; but because the folly of ignorance, pride, prejudice, caste, &c. are ever unduly filling their ranks. No wonder then the endless and periodical failures in them, from two such causes as undue numbers, consequent undue and ruinous competition and speculation in some, and the unfitness of individuals in all.

It is the due proportions of the population in the different professions which is the cause of the prosperity and high wages in nations and colonies in their infancy. It is the infraction of this great law, (the law of occupation,) produced by evil laws, institutions, opinions, and habits, which creates excess of unemployed population, consequent low wages; these causing the destruction of agriculture, manufactures, and commerce, and consequent national old age, decrepitude, and decay. Prosperity ought to be the greatest, and wages the highest, in the oldest countries; and would be so were the law of occupation duly and fully observed, and the observance duly proportioned. Political economists may, yet awhile longer, tell us this cannot be. When I see the ocean filled with nothing but putrid herrings at one time, and at another, with nothing but sharks devouring each other—and the buffalo chasing the lion—the vulture skimming the air in pursuit of insects—and the swallows flying away with lambs and kids—when I see the orange and the pine apple perish in the south, and more plentiful in the north than grass and wheat—I, for one, will believe them.

All national prosperity, stability and permanence, as well as all individual well-being, are dependent upon the different branches of *productive* industry being duly proportioned to each other. As this happy state of society is becoming more and more established, nations will become more and more prosperous, industrious, civilized, happy, stable and permanent: and as they go on, more and more so, and interlocked and identified with each other in the interchange of the various productions of the different *latitudes*, by means of commerce, (the great civilizing power,) promoting each other's prosperity, wealth and happiness —wars, (idleness, poverty, misdirection of occupation and non-intercourse, being the cause of them.) poverty, deficiency of food, excess of population, &c. &c. will gradually cease, and be no more.

Could we but ascertain merely the proportions of the different professions of the populations of the once vast and powerful, but now wholly extinct, empires of the east, from their rising to their setting, we should at once see the real cause of their "decline and fall." In all ancient empires, neither national nor individual legitimate industry, powers and means, were called into action; they had no legitimate existence or direction whatever. All and every thing were ropes of sand; there were no bonds of union, domestic or foreign, none were dependent upon each other's industry; all was consequently brute force, violence, fraud, oppression and aggression; and consequently, they fell, not by the acts of any individuals, for individuals have no such power, but by the radical and inherent defects of their whole national and individual relations. They had only five classes; soldiers—the idle unproductive rich—slaves—what may be termed the idle productives—the builders of temples, pyramids, pillars, tombs, mausoleums, theatres, &c.—*and the miserable cultivators of the soil.* Their fate was inevitable. How entirely different are the conditions and relations of modern nations, both internally and with regard to each other! Yet how far from what they ought to be!

In the immense mass of public buildings in ancient times, there are none which, after their erection, added any thing to the national wealth, or opened, in any degree, the channels of productive industry. This was an immense and incalculable evil. An ancient emperor, or patrician, fed hundreds of wild beasts; hundreds of modern agriculturists and manufacturers consume the *same quantity* of food. The former left nothing but their skins; the latter add millions to the national wealth, and create means for the support of thousands in perpetuity.

What a wretched political economist is he who says, that he who builds palaces, keeps dogs, hunters, race-horses, gives expensive entertainments, &c. employs the poor, and benefits hundreds! and that every man has a right to spend his income as he likes! Is there any error so great and mischievous as this doctrine? The Duke of Bridgewater laid out his fortune in mak

ing his canal. George IV. and many nobles, spent the products of other men's industry upon palaces. Who can calculate the difference of the effects of each, upon the national industry and wealth for a hundred years afterward? The canal employs thousands and millions, directly and indirectly, in *productive* industry, for ever afterwards; the palaces engage thousands in consuming idle, unproductive existence only; destroying the products of the industry of others, without rendering any equivalent productive return.

When we view the hordes of the idle rich and the idle poor—the unemployed, and the wrong and unproductively employed—the useless in all professions—the tax-gatherers—soldiers and naval sailors—the useless hangers-on and dependants of nobility—beggars—thieves---convicts—-gamblers —horse-jockeys—the army of government officers and laborers—the government aristocrats, (the fund-holders)—the sick, &c. &c. we shall find, in England at least, that it is not the industrious many who support the idle few, but the really industrious productive few, who support the idle and unproductive many. The really improving productives in England and the United States, are greater than in any other countries; hence their present condition. If *all* were any thing like productively occupied, and industrious, the danger would be of far too much production of food, instead of too little, and constant unconsumed *excess*, instead of *deficiency*, would then be the result, *were the observance of the law of occupation not duly proportioned;* this being the means of duly proportioned production, and the check to undue and excess of production of some things, and deficiency of others. For the want of the observance of the law of occupation, even now excess of production often takes place in agriculture, and particularly in manufactures. Before the establishment of manufactures in the United States, agricultural produce was sometimes almost wholly unsaleable.

With the law of occupation, the law of primogeniture is wholly inconsistent, and consequently the law of subsistence is violated, and the true principles of agriculture cannot be practised and developed. How can any right, real improvement of the soil, to the proper extent, take place in England, with the law of primogeniture and entail? Under the operation of these laws, neither the tenant nor landlord can do justice to the soil. The tenant, at will or under lease, and in both cases at exorbitant rent, with no permanent interest in the soil, with all he does, being of no advantage whatever to his children, but the contrary—will he, can he, ought he, to improve the soil? Will the landlords do it? No. In ninety-nine instances in a hundred, they are unfitted by nature, and in all, almost wholly unfitted by education, habits, pursuits, &c.; spending their means upon palaces, living in London or abroad, horse-racing, hunting, gambling, &c. Then how have the improvements in England, as far as they have gone, (and much has been really and wonderfully done,) been accomplished? By the force of the demand of the *non-agricultural* population, by the vast demands of the manufacturing, mining and commercial population. What would have been the results had the occupiers been the owners of the soil, and the owners the occupiers?

Why have the owners of the soil in England, who have been the occupiers, not in general improved their estates better, equally and proportionately with the tenantry? for it is a fact that they have not done so: because they are generally the *hereditary* owners, *rarely fitted by nature for the occupation*, and still less so by their education, associations, habits, and other pursuits. The *hereditary* owner of a moderate estate, in the midst of large hereditary estates, is placed in a most perilous and dangerous situation; his habits are those of the opulent aristocracy by which he is surrounded, and having no rent to pay, he fancies himself a great deal more secure than he really is. He identifies himself far more with the rich owners of the soil, than with the tenant occupiers.

To investigate the real positive utility of, in themselves, an *idle*, *unproductive*, *hereditary aristocracy*, would be a curious and most important inquiry. They promote literature, the fine arts, *certain* forms of good manners and civilization, morals and habits, cleanliness, &c. What more? Are monarchies and aristocracies to restrain and suppress the effects of ignorance? to govern society by *fear* and subservience in the *absence* of knowledge, morals and principles? It would appear to be so.

The primary, and great source, and cause, of the real impediment to the right advancement and prosperity of the national and individual interests in the United States, (and all other countries,) at the present moment, are the *deficient* proportions of productive industry and occupation to the agricultural portion of the community, and the too great proportion of the soil in cultivation to the *existing* population. And though little suspected or thought of, these are the main causes of the present deranged state of all the commercial relations. No country, and the currency of it, can be in a healthy and stable condition, until all the manufacturing and other branches of productive industry are duly proportioned to the agricultural, and until the soil in due cultivation is duly proportioned to the legitimate wants of the existing population.

The present condition of the United States, is a transition one, from a purely agricultural state (the worst possible a nation can be in, next to the purely savage and pastoral,) to *varied* occupation. There are yet too many farmers and too few of other productive professions; yet now sufficient of the latter to press upon the existing deficient means and defective system of subsistence, induced by the excess of agriculturists and the deficiency of a healthy productive non-agricultural population. The remedy: More non-agricultural productives, to produce a *consequent* improved system of agriculture upon the soil now occupied, (*vide* England) which will be in no degree promoted by importing grain from countries which ought to consume it at home. To encourage the importation of food, (the *defrauded* surplus of unduly fed populations abroad,) to lessen and check the existance, growth and extension of home non-agricultural industry and production, with a view to increase, or in any otherwise to increase, the already by far too great extent of the occupation (for cultivation it cannot be called) of the soil, would betray the utmost extent of legislative ignorance of the true interests of society. To those entirely unacquainted with agriculture, it would obviously appear, that the more of a population is

employed exclusively in agriculture, the greater would be the production of food. The reverse is the fact. The more agricultural a natien is, and the worse and more unproductive is and must be its agriculture. There is a sad and most fallacious view of this sort in the late report of the Secretary of the Treasury, (1837.) The true productive, and *increasingly* productive, and *really economical* system of agriculture, *can* only exist with the bulk of the population otherwise productively employed than in agriculture. To those who understand the true principles of agriculture, all this is abundantly evident; to those who do not, the example of England will abundantly prove it. No country was in a lower condition than England when purely agricultural, and that at no distant date. She was sunk in poverty and barbarism. when Italy was prosperous, wealthy and civilized. As the agricultural population proportionately diminished, and other productive professions increased, exactly did her prosperity, wealth and power increase, with at the same time endless and most heavy drawbacks and burthens upon agriculture. What would have been the condition of England now, had there been a just and economical government, and the soil had been placed upon an equal footing of freedom and security with her manufactures and commerce.

The scarcity of food of late in the United States, I foretold many years ago. But not because there are too few employed in agriculture, as hinted at by the Secretary of the Treasury, but because the system of agriculture created during the period of the nation being an almost purely agricultural one, is still pursued with an increasing non-agricultural population. The agriculture of the country has not yet improved with and by means of the non-agricultural population; but it will most assuredly do so, if that population is not *madly destroyed and perverted from its present occupations.*

The view taken by the present political economists of *wages* and *human* labor, its supply and demand; of deficiency of food, excess of population, their causes, operations and effects, are most fallacious and mischievous, and will ever be so, so long as the *labor of man* is merely viewed as a common dead commodity. A far higher view than this must be taken of its operations and effects. They have yet to learn that *low wages* are the primary cause of excess of supply of labor, and not the effect in the first instance. The two unquestionably become cause and effect upon each other.

The causes of too low wages are the ignorance of the people, the *equal* and corresponding ignorance, and the narrow, selfish, short-sighted views of capitalists, as to their own true and permanent interests and those of the operatives—the interests of both being intimately and indissolubly bound together—but above all, from the undue, disproportioned, and non-observance of the law of occupation. *High wages* are advantageous to all, more or less so directly and indirectly, but to none so much so as to the farmer; they give him better prices, they enable him to cultivate the soil by the only true means of improvement and increasing fertility, and with the greatest economy of labor, *in requiring the due proportions of grain and cattle crops, &c.* The farmer who advocates low wages, commits a quadruple suicide. The manufacturer who advocates the same, cuts the throats of the far greatest *majority* of his customers. The manufacturer who pays low wages, sells a diminished quantity at a diminished price only; but the farmer who pays low wages, cuts up his power and means of production root and branch, for he destroys the fertility of his soil, and possesses no power to maintain and increase it; that is, if wages are *below* the bread and meat power of subsistence, which is the natural law of subsistence. The profits of the farmer will be the greatest and highest, when all have the power and means of obtaining all that is essential for the due, healthy, legitimate existence of man; for then will prices be the highest, or in other words, the most duly proportioned, and the labor required, the least possible. The prices of all the different productions are always proportioned to each other exactly as the law of occupation is observed. All the other productive professions have always been the least duly proportioned to the agricultural, (the latter being in excess and the former deficient,) so have the profits of the farmers been usually the least.

Were the different professions all duly proportioned to each other, far less land would be in cultivation in proportion to any existing population, than now is; but the land in cultivation would be many times more productive than before, and at much less expense. All this may appear paradoxical enough to those who have not studied and investigated the operations and effects of the due observance of the laws of occupation, subsistence, and the production of food.

With most political economists, (and farmers as well,) "capital" is every thing—the panacea, the power, the means, the end, the object, the pursuit, the every thing, the all-in-all. Capital is certainly a good and essential power, the product of skill, knowledge and industry; but it is not the first of all essentials in national prosperity, but only a very secondary one. The first is *system*—the primary *unbought* power and means of production. Of what avail is capital to the agriculturist, if the laws of occupation and subsistence are not duly and legitimately proportioned and observed? He may build, make fences, drain, lime, and apply what are foolishly called artificial manures, &c. &c. and the nature and extent of the public demand *compels* him to have a large undue proportion of exhausting crops, and the same crops too frequently repeated, (the greatest of all errors in agriculture,) and withholds from him the means of duly maintaining and increasing the fertility of the soil, stock being far too little in demand. It is *system* which is the all-in-all to him, and this he must be enabled to pursue, by the just and full demand of a legitimately occupied, and consequently, legitimately fed population. Without this, capital is of no avail. It is this which will create it; and which has done so, so largely, in England, and might have done so a hundred-fold more, were the laws of occupation and subsistence more legitimately observed than they have been, and are.

The true system of agriculture would be—*all the grass* crops in succession, according to their respective periods of duration, with *all* the crops for the subsistence of man and stock, and for clothing, &c. intervening; all according to the *latitudes* to which they belong. All those crops which re-

turn the most to the soil, are required to be grown the most, and *vice versa*. The grasses stand at the head. This would require a period of from 15 to perhaps 40 years, before the repetition of any one crop. By a wise and beautiful provision of nature, it is obvious that those crops which return the most to the soil both in vegetable and animal manure, are required to be grown the most. Again, those crops which return the most to the soil, are the least expensive in their cultivation; those which return the least are the most expensive. Nothing is plainer, than that the crops for stock must be grown in the largest proportions. The more the grass crops are cultivated under the convertible husbandry, the more will be the *whole* produce, although the arable crops will be so much less in acres, and the less will be the expense and labor. Nature has been peculiarly bountiful, kind and considerate to the farmer, if he and society will only obey and observe her laws.

The great purpose and secret in agriculture, is *system*—that is, the right and proper rotations of crops; these being right, the gradual, increasing and permanent perfect full fertility of the soil, will be mainly accomplished, at no labor and expense whatever; nature producing the intended and required effects, by the silent, costless operation of her own laws, the crops themselves producing the means of subsisting each other. If the rotation is wrong, no expense and labor will remedy the consequent errors and defects. Machinery is of very limited application in agriculture, therefore nature has given the farmer similar advantages to the use of it in other professions, by *system*. All the essential wants of human nature, are justly belonging to all, therefore if not attainable by all by means of manual labor, there are clearly means of making them so, by machinery, system, &c. Knowledge is essential to all; this could never be communicated by writing, therefore some cheap method was attainable, which is printing. There is no better guide than this principle in attempting any new discoveries; that is, in all we do we must begin with first principles.

As a proof (amongst hundreds) of how little principle and system are even yet understood and practised by the farmers in England, we shall often see them employing a *very large additional temporary* force in harvest; sowing and hoeing turnips; weeding grain crops, &c.; and, if they can afford it, even boasting of having employed a more than usual *temporary* force in some particular operation, deeming it an act most meritorious and skilful! Again, how often do we hear farmers say, "but I farm differently from others; I buy a great deal of manure, I keep stage-horses upon my farm, and I can farm as I please! I can take two or three crops of wheat together!" The fact is, the *true principles* of agriculture are the same every where, and under all circumstances. Animal manure is not the only indispensable principle—the sole panacea. If one farmer can procure double the quantity of manure another can make, this does not do away with the necessity for practising the same system. Rightly applied, this increased quantity of manure, would greatly increase the crops—but the farmer who presumes upon this aid alone, to depart from the true principles of agriculture, will find himself, eventually, a severe sufferer. The farmer who has no fixed, steady, undeviating principles of action, whatever may be his means of procuring manure, (of any kind,) is in the infancy of his profession. How wild, random, and unsettled are, as yet, the best *apparent* practices of agriculture! What would be thought of the commander of a ship, who steered now here, the next day there—one week required 10 men and the next 100—and so with others? Yet this, and far worse, is the every-day practice of farmers. I know, as yet, no reason why a farm should not be carried on with the same fixed steady principles as a ship or manufactory. If we read the works on agriculture, if we examine the voluminous reports of the English parliament, we shall find no two men agreeing upon the same principles. It is surely time that all this ignorance, for it is nothing else, *should begin to have an end.*

Manure is only one principle in agriculture; the important one, vegetable matter, (grass and other roots,) is another, and succession of crops is a third. Of all the principles in agriculture, still so obscure, hidden, and little understood, none is apparently so obvious and clear as the imperative demand of nature, that crops should be varied to the extent of all the different kinds in existence. Yet we continue to cultivate not a tythe of them, and repeat them everlastingly; and bitterly do we pay for our wilful ignorance and wretched arrogance and presumption. Even in the United States, *from the population being too purely agricultural*, during the French revolutionary war, (although wages were very high, and the people fully employed in agriculture, commerce, building, making roads, bridges, &c.) and the demands of Europe being chiefly for *bread-stuffs*—a system of almost exclusive *arable* cultivation, and consequent destructive one, was introduced and established, which will require years and years to remedy and counteract. That war, with the home exclusive agricultural population, was as destructive of the fertility of the soil, and the means and powers of its improvement in the northern states, as is the present system in the southern states, of supplying Europe, &c. with cotton, together with its present exclusively agricultural population.

I attribute the extensive and disastrous failure of the turnips, potatoes and clover in England, of late years, to the deficiency of vegetable matter, (grass) and the too close repetition of them. The crops are diseased, and consequently are attacked by insects, which are supposed to be the cause of all the mischief! This is a very shallow and very common way of investigating things, viewing the *last* effects as the *primary* cause.

The true successful period of sowing and planting all arable crops is very short; therefore, manure can only be directly applied to them with great expense and additional labor, and risk of failure by consequently sowing too late; therefore it must be wrong so to apply it, however otherwise advantageous the direct and immediate application of manure might be, which it consequently is not. Manure is much more economically and better applied to grass than to any other crops. By applying manure in the spring and fall to the grass crops, there is the least possible waste of it; the greatest possible quantity of grass is raised at the least expense, and the soil put in the best possible condition at the least expense, for the subsequent arable and grain crops.

Is straw an essential, profitable, economical

and advantageous food for stock? Clearly and most obviously not. In all our investigations, we must begin with first principles. On no well regulated farm, is there more straw than will keep the requisite stock clean, dry and warm, and thus preserve the manure. Straw contains little nutriment, and is very indigestible; and if any manure is lost by the use of it as food, it is obviously the most costly and unprofitable food a farmer can consume. I know of no more speedy and certain method of bringing a farm into the hands of the sheriff, than growing an undue proportion of tillage crops, and using the straw as food.

Take *all* the crops formed for the use of man and stock in succession, the grasses intervening one to ——— years, between one arable crop for stock, and one arable grain crop for man—never more than three arable crops together—two the best.

Every crop to be repeated as distantly as possible.

Sow clover with every arable cattle crop, to plough in for the next crop.

Manure no arable crops excepting Indian corn, potatoes, turnips, millet, &c.; and applied on the surface as long as possible before planting, and applied very moderately.

The rest of the manure, with lime and plaster applied to the *young* grass; after mowing the grain stubbles, applied very moderately.

Lose no manure of any kind, liquid or solid.

Never apply any labor to destroy weeds; they will go of themselves, if the due supply of *vegetable* matter is created by the *grass* crops. Weeds are a true test of agriculture.

Although agriculture is in reality the first and most important of all human occupations, and the foundation of all others, and the first means of all human existance, all other legitimate productive occupations are the foundation of it. It is the first, yet it is the last, which can be fully perfect. The improvements and labors of individuals in all professions and sciences, are utterly vain and nugatory, unless the condition of the population is equal to sustain those improvements and labors; hence in countries where rank and titles are yet worshipped and looked up to, credit is given for many accomplished and created results, to individuals, which are due alone to the condition and well being of the public. Discoveries, and the developement of science and knowledge, are not made so much by superiority of intellect, as by developed previous knowledge arising from the pre-existing and existing wants of society, affording a guide and clue to them. The most brilliant Greek or Roman never could have discovered the steam-engine, steam-boats, coal-gas, rail-roads, &c. &c. &c.; they had no previous guiding power, influence and knowledge, to lead them on to do so. Discoverers have never been willing to admit and acknowledge this influence and directing power over their minds; credit is given them for much more merit and talent than they possess. I am fully aware of the full effect of this power and influence in my own discoveries, respecting the use of weeds, the law of human subsistence and occupation, and the discovery of (as I believe) the true system of rotation of crops consequent to them; and the discovery of the true cause of the fly in the wheat, the worm in the peach, the failure of the turnip and potatoe crops, the true system of manuring, &c. &c. My knowledge obtained in England, and then seeing the wants and state of society in the United States, made the developement of all this easy and consequetive. I have not a whit more talent than certain other men; they had, and have, no more talent than I have; previous certain knowledge, constitutional organization, and existing circumstances, place all discoverers upon a level.

Socrates and Plato would have been fools in conversation and knowledge respecting manufactures and many other subjects, with the most stupid and illiterate cotton-spinner in Manchester.

That must be the truest and best system of agriculture:

Which requires the least labor comparatively and positively.

Which requires the least *additional occasional* labor. (A very sure test.)

Which returns the greatest quantity of stock, grain, material for clothing, &c. together.

Which furnishes sufficient manure for *all* the *young grasses*, the corn, turnips, potatoes, millet, &c.

Which permits all the crops to be sown, planted and harvested in due season, without hurry, and with the least *additional* labor. By this rule, the surest and best, much of the agriculture of England is exceedingly defective.

Which permits the greatest quantity of stock and produce to be sold without creating any deficiency of manure.

Which is yearly improving and increasing the crops, and the fertility of the soil; and without essentially increasing the labor.

Which produces improving quality as well as quantity of produce.

Which diminishes the growth of weeds without any labor being expressly and exclusively applied for *their* destruction.

Which makes the crops more and more independent of seasons, and proof against the attacks of insects.

Which returns the greatest possible quantity of vegetable matter and animal manure to the soil, without at all curtailing the sale of the just and due proportions and quantities of produce, in accordance with the *legitimate* wants and demands of society. If sufficient manure *cannot* be made, either the crops are very unduly proportioned, or they are still deficient.

In short, that is the true system which will furnish food to all in accordance with the law of man's subsistence, as he is organized to subsist. The true principles of agriculture must be, and are, in accordance with that law. And man's organization must be, and is, in accordance with the true principles of the law of the production of his food; and the law of his occupation must be and is in accordance with both these.

GEORGE HENRY WALKER.

From the Nantucket Inquirer.

PEAT.

Peat is of vegetable origin, aud is formed in cold, moist situations, where vegetables may be decomposed without putrefaction. Hence, in the torrid zone it is never found; but as we advance north it occurs, and on the borders of frigid regions it is found in great abundance; a cold humid atmosphere being peculiarly favorable to its generation.

Peat is composed of aquatic plants, such as reeds, rushes, etc., but a species of moss (Sphagnum Palustre) is generally found more abundant than any of the former class; it having the property of sprouting, and continuing to grow, while its roots are decaying.

In some peat, (as is the case with our own,) plants are found with their organization so distinct, that we can even determine their species. As is said in one of the Bridgewater Treatises, "that we may almost seize nature in the act of making coal before the process is completed," so it may be said in regard to peat; for the rude fragments of undecomposed plants we trace the process to perfectly formed peat, where a complete decomposition has taken place; and from thence to anthracite.

There is, however, a striking difference between the periods in which the vegetable depositions that form anthracite and peat took place.

Geologists agree in assigning the epoch to be antediluvian in which the vegetable deposits that form coal were made; and they also conclude, that the temperature of the earth was much higher than at present; for fossil ferns are found in coal formations, of the astonishing length of fifty feet, and other plants bear the same ratio. Now plants of this species in the torrid zone are found to approach this size at the present time; but coal is found in the temperate and frigid zones—consequently, we are led to suppose, that a higher temperature once existed in those regions.

But peat is of recent origin, as may be shown by the following facts. In Hatfield, England, as in many other places in Great Britain, Roman roads have been discovered eight feet below the peat; and their arms, axes, coins, etc. have been found in the same situation, showing that these peat bogs have been formed since the invasion of Cæsar. Nor can any traces of the great forests spoken of by this general in his 'Commentaries,' be discovered, except by their fragments, which are found in peat. And De Lue has ascertained, that the very positions of the forests spoken of by Cæsar, viz. Hercinia, Semana, Ardennes, and others, are now occupied by peat-bogs.

As orders were given by Severus and other Roman emperors, to destroy all the forests in the conquered provinces, it is evident why the remains of these once majestic tracts are found imbedded in peat: for when they were prostrated, their trunks, limbs and leaves, would check a free drainage of the water falling from the atmosphere, and also prevent in some measure its evaporation. Consequently, a decomposition of the foliage and branches of the trees would commence—aquatic plants would spring up, and decaying, add to the mass which is found in time completely to envelope the pristine forests.

An occurrence of the recent formation of peat took place in Roos-shire, Eng. During a violent storm, a forest was overthrown, and in fifty years, the people dug peat, from a mass occasioned by this overthrow.

On examining some of the peat formations which are so extensively scattered over our island, we have observed large stumps, trunks, and limbs of trees completely immured in peat. There seems to have been a deposition of shrubs, flags, and other plants, which we find but partially decomposed.

After this formation had taken place, forests sprang up, which have been cut down, probably within a century, and their fragments have aided in forming our peat bogs, which are now discovered from one to fourteen feet in depth. Without doubt, most of our peat formations have taken place since the pristine forests were destroyed, and are comparatively of recent origin. We will further state what seems a curious, but is a well ascertained fact, that not only here, but wherever the peat is discovered, it is generally found to occupy the position of ancient forests. For in most bogs, stumps, and trunks of trees are found surrounded by peat, while their roots remain in their natural position, immured in clay, or some other soil.

In some countries, peat mosses are found of great extent. One mentioned by Dr. Boate on the Shannon, was fifty miles; and Blavier speaks of one at the mouth of the Loire, more than fifty leagues in circumference.

The texture of peat is such, that it absorbs large quantities of water; and it has often happened, when bogs were very much swollen, that they have burst and deluged the surrounding country with their contents. We are informed by Deguer that the remains of ships, nautical instruments, and oars, have been found in many of the Dutch mosses; and Gerard in his history of the valley of Somme, mentions that in the lowest tier of that moss, a boat was found loaded with bricks, proving that these morasses were at one period navigable lakes, and arms of the sea, as were also many on the coast of Picardy, Ireland, and Friesland, from which soda and salt are procured. "The canoes, stone hatchets, and stone arrow heads found in peat in different parts of Great Britain, lead to similar conclusions."

One more fact in relation to peat is worthy of our notice. It is the preservation of animal substances which have been buried in it. A great many instances are recorded, which go to prove this property; a few, however, will only be mentioned.

"In June, 1717, the body of a woman was found six feet deep, in a peat moor in the isle of Axholin, in Lincolnshire, England. The antique sandals on her feet afforded evidence of her having been buried for many ages; yet her nails, hair, and skin are described as having shown hardly any marks of decay. In the 'Philosophical Transactions,' we find an example recorded of the bodies of two persons having been buried in moist peat, in Derbyshire, in 1674, about a yard deep, which were examined twenty-eight years and nine months afterwards; the color of their skin was fair and natural, their flesh soft as that of persons newly dead." At the battle of Solway in the time of Henry VII. (1542,) when the Scotch army commanded by Oliver Sinclair was routed, an unfortunate troop of horse, driven by their fears, plunged into Solway morass, which instantly closed upon them. The tale was traditional, but it is now authenticated; a man and horse in complete armor having been found by peat diggers, in the place where it was always supposed the event had happened. The skeleton of each was well preserved, and the different parts of the armor easily distinguished.—*Obs. on Picturesque Beauty*, 1772.

For the Farmer's Register.

THE WIRE WORM.

March 13th, 1838.

For the last fifteen or twenty years, our crops of corn have been materially shortened, and especially has the labor of making them stand, been much increased, by the attacks of a small worm, not unaptly (from its size and form) called the wire worm—by some called the web-worm. This little animal lives during the winter in the pith of weeds; especially the stick-weed, and has been known in this part of the state only since the practice of enclosing and non-grazing. I can remember well its first appearance. It is not the cut-worm, so injurious to newly planted tobacco and young cabbage plants; nor does it work its injury in the same way; but it assails the corn as soon as it comes up, just in the bud, where the roots and stalk spring out, and eats into the bud; not always *entirely* killing the plant—but so enfeebling it as to render it worthless. Every one remembers how fatal this little worm proved to be last year; and, no doubt, any plan proposed to avert the evil will be tried, if it be neither expensive nor troublesome. Such is one I suggest now, viz:—simply to steep the seed-corn twenty-four hours in a strong decoction of tobacco; any refuse tobacco, or even stalks, will answer. Having suffered exceedingly from this worm last year, and finding that two of my neighbors did not suffer at all, I inquired the cause, and was informed that the use of tobacco juice as recommended above had the only assignable cause for their exemption from the injury so severely felt by me and many others. I understand from them, they had used this remedy for some time, by the advice of Mr. William Skipwith, formerly of Cumberland county, whom I had long known as a good cultivator; and whose land, from a long continued system of enclosing and not grazing, was peculiarly foul, and liable to injury from the worm.

One of the numbers of your Register, some time last spring, spoke of the great injury sustained by Mr. Carter of Shirley, from this or a similar worm. If Mr. Carter will use the preventive, I propose, and it should prove effectual, I shall be well rewarded for the little trouble of making this communication, by the reflection that he has been (however inadequately) rewarded for the great benefits he has conferred on agriculture, both through your paper and by his example.

ARATOR.

From Dr. Granville's Report to the Thames' Improvement Company.

ON THE VALUE OF HUMAN EXCREMENTS AS MANURE.

This very question having been submitted a few years since to the consideration of the late Professor Hembstadt, of Berlin, by the Saxon and Prussian authorities, who were desirous to apply the contents of the city drains and cess-pools to the recovery of barren and sandy lands, in the environs of Berlin and Dresden—that eminent agriculturist undertook, in conjunction with other learned men and practical farmers, a series of experiments, which were carried on for a great length of time, and were varied in every possible way, in order to avoid all sources of fallacy. The results of those experiments, Hembstadt afterwards published, and they led to extensive agricultural operations, all of which proved successful. Professor Scuübler, the writer of the most esteemed and certainly most able 'Treatise on Agronomia,' or the best mode of knowing and treating every species of land, repeated and added to the experiments of Hembstadt, from which he obtained alike results. These he published in a tabular form, which has since passed into the hands of all the large practical farmers in Germany, and have formed the basis of instruction on manuring, in the hands of professors of agriculture, whom many of the continental governments have, with infinite advantage, established in institutions purposely formed to disseminate useful and practical truths in the art of arming. From that table the following facts may be collected.

If a given quantity of land sown, and without manure, yields three times the seed employed, then the same quantity of land will produce

5 times the quantity of sown, when manured with old herbage, putrid grass or leaves, garden stuff, &c.
7 times with cow dung,
9 times with pigeon's dung.
10 times with horse dung,
12 times with human urine,
12 times with goat's dung,
12 times with sheep's dung, and
14 times with human manure, or bullock's blood.

But if the land be of such quality as to produce, without manure, five times the sown quantity—then the horse dung manure will yield fourteen, and human manure nineteen and two-thirds the sown quantity. *

In addition to this information, it was ascertained that the most important crops—those, I mean, which yield most profit—such as flax, for example, so extensively cultivated in both Flanders, can only be obtained in abundance, and of the finest quality, by employing human manure.

But by far the most important point of practical knowledge in this matter, put forward by the same great authorities, and the truth of which was afterwards confirmed to me by more than one great farmer in East Flanders, is, that while the manuring with human soil has produced fourteen times the quantity sown, where horse horse dung has yielded ten—the proportion of the human or Flemish manure employed, was to that of the horse dung, as one to five only; so that with one ton of the Flemish, a larger produce is obtained, than with five tons of stable manure. These indisputable truths being once ascertained, let us see how they would work practically in this country.

In England a ton of good stable manure sells for five shillings. Now an acre of arable land in an ordinary state of cultivation in England, is ma-

* It is curious how this corresponds with one of the experiments made by Mr. Burrows, an intelligent Norfolk farmer, who received the gold medal from the Society of Arts, for them. On four acres of broadcast wheat, Mr. Burrows obtained 14 quarters and a fraction of wheat, hoving emploped one quarter as seed. Had he manured his land with Flemish manure, instead of 14 quarters, he would have obtained 19 2-3 quarters for the one he employed.

nured with 20 tons of horse or stable dung every fourth year, according to Professor Coventry, and consequently entails an expenditure of £5 in that year. It then produces ten times the quantity of wheat sown. But an acre of the same land, similarly sown and manured with Flemish manure, would require only four tons of it; and entail, at the price we have fixed for that manure, an expense of £2 8s. It would, then, produce fourteen times the quantity of wheat sown.

Supposing the produce of the acre manured with horse or stable dung to be five quarters of wheat, † and sell for £15, that of the acre manured with Flemish manure, will be seven quarters, and sell for £21.

The end of this comparative farming operation therefore would be,

1st, a saving in manure, £2 12s. per acre,
2nd, a surplus produced, £6 0s. do. in money,

Total £8 12s. per acre.

A sum which the employment of the Flemish manure would put into the pocket of the farmer, above the largest numerical result he can obtain by his mode of cultivation. Thus far as to his private interest; but in this operation the public would also be a gainer, inasmuch as by means of it, two more quarters of wheat per acre would be sent into the market—a circumstance, which in the year 1832, would have prevented the necessity of importing into this country 463,502 quarters of foreign wheat, as appears from a return made to an order of the House of Commons in 1833.

But even this marvellous result of Flemish manuring, in the cultivation of wheat lands, falls into insignificance, when compared to that which it yields when applied to other cultivations, the produce of which, as I ascertained by minute personal inquiries at some of the largest farming establishments in Belgium, instead of being nine only, above the ordinary produce, as before mentioned, rises as high as 12, 15, 20 and even 40 per arpent. The same may be said of it, when applied to lands completely barren, and which, having been originally rented for one florin the arpent, have, in the course of four years, been improved, through Flemish manuring, into an easy rent of 30 florins per arpent. Examples of this sort are numerous, and many such were furnished me by the authorities at Brussels, La Haye, Rotterdam, and Berlin.

† This is assuming a most favorable return, since I find in a report on the "Allotments," in the parish of Missenden, (as a fact of which they seem proud) that the land would, under the plough, in an average year, produce only 20 bushels of wheat, or 2½ quarters; and even Mr. Burrows, in his first-rate experiment of four acres of drilled wheat, obtained no more than sixteen quarters and three bushels, making four quarters and less than one bushel per acre. Now I have it in my notes, taken under the distation of Mr. Smet, a great farmer in East Flanders, that a measure of wheat land corresponding to an English acre, manured with Flemish manure, produced last year 7½ sacks of wheat of the best quality. The sack contains four measures each, weighing 180 lbs. of 16 ounces; consequently there grew upon that acre 5,400 lbs. of wheat. Whereas, taking the Winchester bushel of wheat to weigh 60 lbs.; the acre of wheat land among the "Allotments" at Missenden, produced only 1,200 lbs. and the experiment of Mr Burrows 1,980 lbs.; while admitting even my assumption of five quarters to be correct, the acre in England would yield no more than 2,400 lbs., being less than the half of the Flemish produce.

From the St. Louis Bulletin.

THE RAFT IN RED RIVER.

The obstruction originally occupied a space of upwards of two hundred miles; and, there is sufficient evidence that it has existed for ages before the discovery of the country, while its banks exhibit indubitable proof, that it once extended not within fifty miles of the confluence of that river with the Mississippi. The annual increasement has been estimated at two miles; and once formed, the serpentine course of the stream forbids all possibility of removal, except by artificial measures, or the slow process of decay. In some places the raft is condensed to an astonishing depth, and forms what is called "the sunken raft:" a single strong log removed will sometimes liberate hundreds. The raft region may now be considered under three divisions; that from which the raft is entirely removed, extending 140 miles from the commencement; that in which the raft is cut up and pulled in pieces, and not floated off—for which nothing is wanted but a strong current, which must immediately take place—33 miles in extent; and that, lastly, which has not yet been commenced. The water expelled from the channel by the raft into the lakes, parallel to the banks as the obstruction is removed, turns and deepens the bed of the stream. At the commencement of the raft there is little or no current. This has added much to the labor in removing the obstruction; and many of the logs removed, have floated back subsequently by a rise in the Mississippi. The removal now of a few yards of solid raft causes a fall of eighteen inches above it, and a rise six feet below. There remains only about four miles of the raft to be removed, and, when the channel is once clear, the current will be powerful and deep, and the banks on either side will be lofty and firm. Capt. Shrieve declares, that all can be accomplished in *three months*, after a suitable appropriation from Congress is made.

The magnitude of this undertaking, and the results which must ensue from its accomplishment, cannot be too highly appreciated. The river is navigable for more than 2,000 miles above the raft, and through a region unrivalled in fertility Though now thinly settled, it is rapidly populating —hundreds await the removal of the raft as a signal for entering the country—and all its vast resources and natural wealth must soon be developed. The result of this undertaking once involved in doubt, as well as the permanent advantages which must ensue, are no longer problematical. The indefatigable industry, the untiring enterprise—the indomitable perseverance, and the enlarged and truly scientific designs of Capt. M Shrieve, the projector and accomplisher of this noble national work, can never be estimated beyond their merits. His history is identified with that of the empire of the west; and his fame will endure so long as the magnificent streams with which his name is associated, shall continue to roll on their volumed waters to the deep.

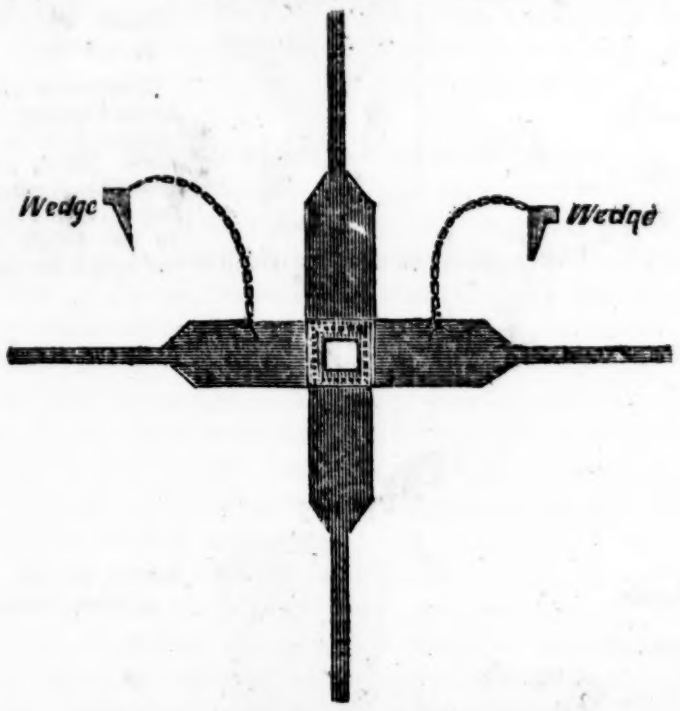
JOHNSTONE'S 'TREATISE ON DRAINING, EMBANKMENTS,' &c.

(Continued, from page 728, of Vol. V, and concluded.)

PLATE XIX. *Implements for draining—described or referred to, in preceding pages of the Treatise.*

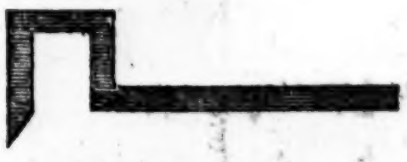
PARTS AND APPENDAGES OF THE AUGERS.

Double Wooden Handle, having an iron plate on both sides, to strengthen the hole for the rods.



Auger and shell, 1 foot, 6 inches.

Iron key.



Iron key Handle.

Rod—4 feet long.

Chisel faced with steel.

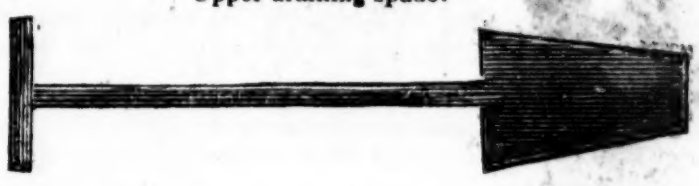
Instrument for cleaning the shell of the Auger.

Punch with steel point.

OTHER IMPLEMENTS FOR DRAINING.

Wooden spade for peat soils.

Upper draining spade.



Bottom shovel, with edges turned up.

Draining spade pointed at the end.

Scoop for smoothing and cleaning out the bottom of the drains.

PLATE XX. *Sections representing the Mode of filling the various kinds of covered Drains, &c.*

No. 1

Loose mould thrown in one foot.
Thin sod inverted 2 inches thick.
Round land stones, one foot thick
Flat stone or cover 4 inches thick
Sough or Conduit 6 inch. square lined with stone.

No. 5

Loose mould thrown in 1 foot.
Straw, &c, 6 inches thick.
Brushwood laid longitudinally & suspended by cross billets of wood, leaving the bottom and sides to the height of the cross billets open. which is one foot 6 inches.

No. 2

Loose mould as above.
Thin sod inverted, straw, heath, or rushes.
Round land stones, or faggots of brushwood.
Flat stone or cover, 4 in. thick.
Triangular opening of 6 or 8 in.

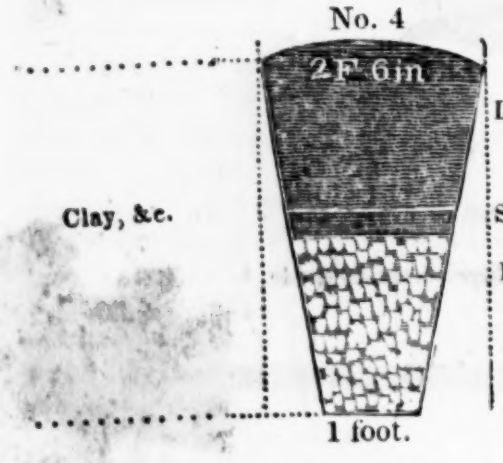
No. 6

Loose mould or gravel, 1 foot.
Sod inverted 6 in.
Pipe, or opening formed by the draining spade 1 ft. deep, & 8 in. wide at shoulders.

No. 3

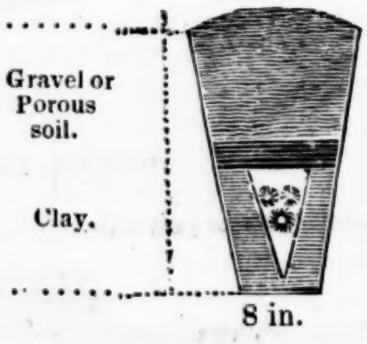
Land stones, &c. same as above.
Triangular, or coupled opening of 6 or 8 inches.

No. 4



Loose mould or gravel, 1 foot.
Sod, straw, heath, or rushes, 4 in.
Land stones thrown in promiscuously, one foot 6 inches thick.

No. 7



Gravel 1 ft. deep.
Clay tramped in 6 inches.
Pipe or opening formed by the draining spade, 1 foot deep, and filled with three large straw ropes, laid longitudinally.

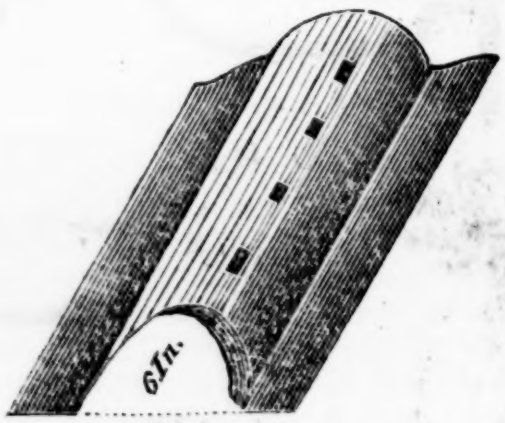
The depth of the above Drains is mostly three feet, but as the nature of the soil may require, the depth may be more or less; and the materials and mode of filling proportioned accordingly.

Draining Bricks.

No. 1.

No. 2

No. 3



ON EMBANKMENTS.

Introduction.

The object of these introductory observations is, to show the importance of embankments, in all situations where practicable, by pointing out the advantages to be gained—the losses sustained by want of them—the causes that produce these losses—and the necessity and means of preventing them.

The object and advantages of embanking are two-fold:—*First*, to defend and protect useful land, exposed to encroachment from the sea and from rivers, where the water, in high tides, and in time of floods, commits ravages upon the banks, by undermining and carrying away the earth and soil, and by overflowing and inundating the low ground adjacent. *Secondly*, to reclaim from the sea, and from large rivers, an acquisition of ground, where the same may be gained without future risk, and at an expense to be repaid by the value of the land so acquired.

Every one knows, that in Holland, the works of this kind that have been accomplished are almost incredible; and are a proof of what human industry is capaple, when its exertions are called into action, and when self-protection and interest are the objects in view.

In England, also, the valuable territory that has been acquired by means of embanking, is well known; particularly in the fens and lowlands of Lincolnshire, Cambridgeshire, Yorkshire, Cheshire, &c. and lately in Wales. In these, and in several other English districts, some hundred thousands of acres have been recovered from the sea, and from rivers.

In Scotland, little has yet been acquired from the sea by embankment; but a great deal has been done in preventing inundation, and by protecting useful land from the influx of high tides, and from the overflowing and ravages of large rivers. On the western coast of Scotland, and in the Hebridean Isles, some acquisitions have already been made; but it is calculated, that above 20,000 acres still remain to be reclaimed from the sea; and along the shores of the whole northern part of the island, in the bays, and at the entrance of large rivers, and likewise by the side of lakes, immense tracts still remain under the power of water. There is reason also to believe, that many thousand acres in the bays of Wigton, Kincardine, Aberlady, Kirkcudbright, &c. could be embanked at a reasonable expense. It may be farther noticed, that there is scarcely a river in all the country, that flows through flat land, which, for want of proper embankments, does not commit, every season, great devastations upon its banks, either rendering large tracts unproductive, or sweeping away the harvest they have reared. On the rivers Forth, Tay, Spey, Don, Beauly, Cree, Nith, Carron, and several others of inferior note, many thousand acres have already been recovered and protected; but much remains to be done in the same way, as will be more particularly noticed in the sequel. *

Land, situated on the borders of rivers, is exposed to injury from them, in several ways: by the banks being broke down, and the soil carried away; the crop injured, and sometimes swept off in time of floods; and from the rivers, when swelled with rain, flowing back into the channels and streams that conduct the water from the upper grounds into them, these smaller streams are also made to overflow their banks, and do similar injury. From the nature of its soil, its situation and climate, such land is more productive than any other. To secure its produce, therefore, is of the first importance.

From the general advantages attending embankments, it seems just to conclude, that in a country like Britain, whose inhabitants are remarkable for intelligence, and for their spirit of enterprise, and where agricultural improvements have attracted such general attention, embankments, on a large and comprehensive scale, would no longer remain neglected; especially when so great an acquisition might, by their means, be added to the productive territory of the country.

Notwithstanding the general indolence, and seeming aversion that appears, respecting the acquisition of land that might be gained by embanking; yet there are many intelligent and public-spirited individuals in both parts of the kingdom, possessing property capable of this improvement, who are fully sensible of its advantages, and have already had the advice of professional men respecting it. By this means, they can form a judgment whether the acquiring a large addition to their estates in this manner, is an object of prudence, or one adequate to the expense attending it.

In attempting to mark out the causes of this general neglect or indolence, it is impossible to join with some writers, who endeavor to trace it to the facility with which this country has always obtained supplies from abroad; or to any general impression of security which may have prevailed in that respect. There is no instance in which individuals were ever found to be guided by such general and distant considerations of policy in their private conduct. Every man is sufficiently anxious to secure the harvest of his labor, and to protect his lands from encroachment; as well as readily disposed to adopt any measure, that offers a fair prospect of territorial acquisition; and it is folly to imagine, that his endeavors will, in the smallest degree, be increased by any impression of what the country might either suffer from his negligence, or gain by his enterprise.

Perhaps a more immediate cause of the inattention to embankments may be found in the general prosperity of our manufactures and commerce, which, by affording a quicker return of profit than any other branch of industry, have hitherto attracted the bulk of the national capital. For, when we consider the great expense, and in some cases hazard, that attends embankments on an extensive scale, and particularly those against the sea, there can be no doubt that a want of capital must have operated more severely against this, than any other branch of rural improvement. At the same time, a great deal must be attributed to the inattention of landed individuals to their property; to a narrow jealousy of the prosperity of tenants; and to a want of co-operation among adjoining proprietors, arising from opposite views of interest, or different feelings of enterpise.

* The author, not being so well acquainted with the bays and shores of the English coast, does not take into calculation what may be reclaimed by embankments in that part of the kingdom.

It is, however, to be hoped, that as agriculture is every day becoming a more favorite object of pursuit—that as proprietors are now in general bestowing more attention to the improvement of their estates than formerly, and of course imbibing more just ideas of things, that the system of embankment will be as generally adopted, as, from its importance, it merits.

If a law to regulate *common drainage* should ever come under the consideration of the legislature, as has been pointed out and recommended in the Section on 'Obstacles to Draining;' one, repecting *general embankments*, would also be an object of no less importance to their nation.

In the course of this Treatise, various situations will be mentioned, both where successful embankments have been made, and where others are practicable; with such directions for executing the different kinds of *sea-dikes* and *water-banks*, * as may be applicable to them; and such drawings, including plans and sections, as will explain their form and construction, according to the situation, the extent of ground they are to defend, and the pressure of water they are required to resist.

PART I.

EMBANKMENTS ON SEA-SHORES.

SECTION I.

On defending shores from the encroachment of the sea; and protecting land upon the coast from inundation by the overflowing of high tides.

Embankments, or (perhaps more properly) bulwarks, for preventing encroachments by the sea, are, in most cases, both difficult and expensive in the execution, and often precarious in point of permanency. The power of water, when violently agitated, is not easily resisted; and when the sea is to be contended with, the means for repelling it must be of the strongest and most effectual kind. Barriers for this purpose require to be constructed with care and stability; as many circumstances occur to obstruct their execution, and to overturn the work when completed.

The sea may commit injury upon the land in two ways:—By breaking down and encroaching upon the coast, when too perpendicularly elevated above its level, and composed of loose, soft, and penetrable materials; and, by overflowing land upon the shore, which, from its low situation, is liable to be inundated by high tides.

It is necessary, therefore, in the *first* place, to point out the proper modes of guarding against, and protecting from its ravages, such parts of the coast where the soil is valuable, and where it is carried away or injured by the sea at high tides.

That water, when violently agitated, can more easily be resisted, by yielding gently to its influence, than by directly opposing its impulse, is so far consistent with truth, that it should always be kept in view, in every operation, where that powerful agent is to be managed. According to this principle, it happens, that where the beach is low, the sea is generally found rather to recede from the land, than to encroach upon it, and, on the contrary, where the shore is steep, the sea makes encroachments upon the land, more or less, according to the nature of the barrier that opposes it. Rock may remain impenetrable for ages; and although immense masses are sometimes overturned by the fury of extraordinary tides, and the incessant beating of the waves against it, yet the progress, in such cases, is slow and scarcely perceptible. But, where the sea is bounded by perpendicular cliffs of clay, or penetrable mould, intermixed with loose stones, its ravages are more rapid, and the effect of one furious tide often occasions very serious damage. This is particularly the case, with that part of the shore on the Frith of Forth, both below and above Newhaven, and to the east of Leith. The artificial barriers, both of stone, and those of wood and stone, that have been erected at these places, have failed to provide security, by their being too perpendicularly constructed, and improperly founded. The general mode that has hitherto been attempted, to stop the progress of encroachment, in these and in similar cases, is, to construct a bulwark of stone, in front of the bank, laying the stones above one another, to the height of the adjoining surface, as carefully as possible, and, forming such a slope, as to give them security. This bulwark is liable to be deranged, and often destroyed, by one or other of the following circumstances, or by a combination of the whole. First, where property is divided, and when one individual fortifies his share, and those on one or both sides of him neglect to do the same, the bulwark is thus exposed, at one or both ends, and the fury of the sea acting upon it at these open, unguarded points, soon brings it to destruction. Secondly, where this may not be the case, and the bulwark may extend along the whole line of exposed bank, the waves, when the sea is violently agitated, ascend the inclined plane, and as they return with still greater force, this body of water, rushing over the stones like a cascade, forcibly displaces them, and the whole bulwark is in time hurled down. Thirdly, the water thrown up, finds its way between the stones and the bank at top, at the place where they unite, and there scoops out the earth from behind them, by which means, the stones, thus exposed, are soon brought down by the agitation of the tide, and dashing of the waves. In order, therefore, to render such kinds of bulwark invulnerable, the base should be broader, the slope greater, and the building should be so high, as to be above the reach of any extraordinary tide. And, as a further security to the bulwark, the most effectual expedient that can be adopted is, to drive piles into the shore in front of it, to break the force of the waves. Of the efficacy of this barrier, a very strong example is given by Mr. Beatson, in his 'Observations on Embankments:'—"Some years ago," he says, "when I was on duty as an engineer at a fort near Portsmouth, built on a point of land much exposed to the sea, the waves made such havoc, that the walls on that side were constantly giving way, although built in the most substantial manner, and having bulwarks of large heavy stones besides, to protect the foundation; however, all would not do—those bulwarks were soon knocked to pieces, and several times the wall itself. At length, it

* Distinctive terms, as used in Scotland. In England, all go under the general name of Embankments.

was proposed to drive a number of piles, about forty to fifty yards from the fort. Those piles were twelve or fifteen inches in diameter, and driven in about one diameter from each other, nearly in a straight line, parallel to the wall where the waves did so much damage. They were driven into the ground with a pile engine, till perfectly firm, perhaps eight or nine feet deep, and about two feet of the top of them left above the level of high-water mark.

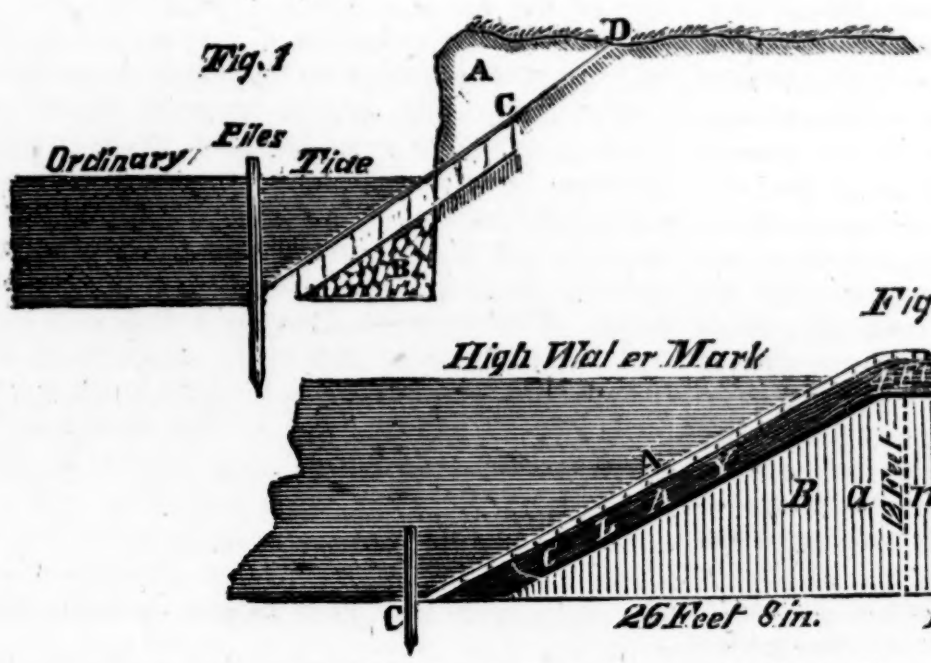
"After this was done, the walls received no further injury, the space between the piles and the fort being always perfectly smooth, however, tempestuous the waves might be without."

Fig. I. of Plate I. is a section of such a bulwark, showing the natural perpendicular face of the shore, and how the same should be sloped, so as to resist the impression of the water most effectually. That portion of the bank marked A, should be removed, and placed in the angular point at B, so as to form a gradually inclined plane, to be faced with stone or turf, as high as the point C, or as far as D. if high tides reach that mark.

Where it may be too expensive to procure stone of the proper form and size, and where the force of the tide is not extraordinarily great, by giving the face of the bank a greater degree of slope, small stones, broke like those used for metalling roads, coarse gravel, or broken brick, may be spread upon the suface, about a foot thick; which, if well beaten down, will make a safe and durable fence. Brushwood, also, spread on the face of the bank, and well fastened down with hooked pegs, is found to answer well, when properly done at first, and carefully attended to. These last methods have been practised on the banks of the Carron at Grangemouth, and answer the purpose sufficiently well. * The wood is subject to decay, and re-

*As directed by the author, on the property of Lord Dundas.

PLATE I. *Sections of Sea Dikes, and Embankments.*



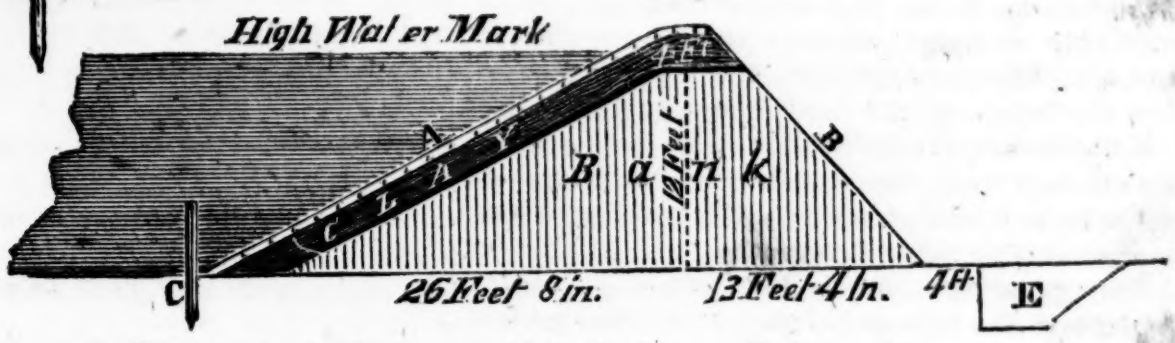
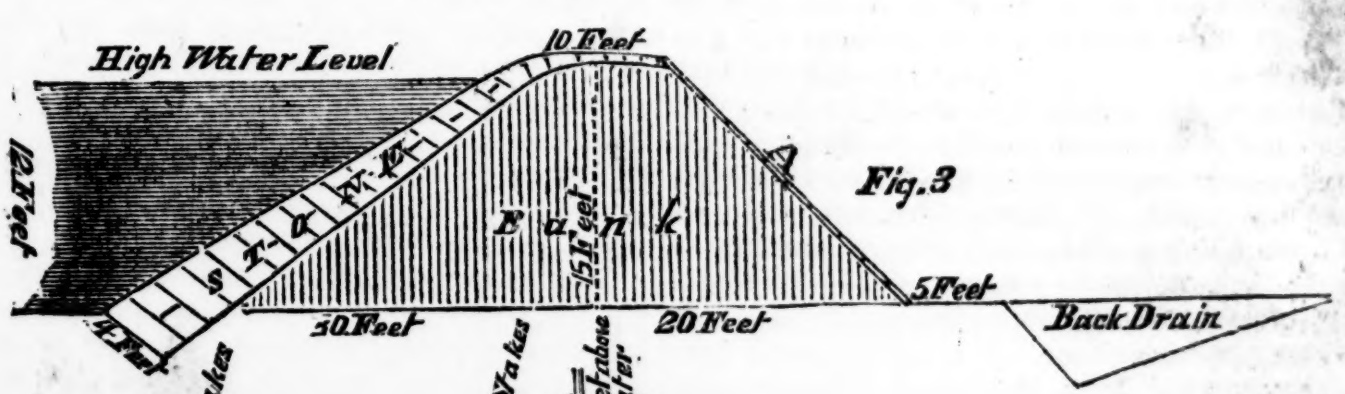
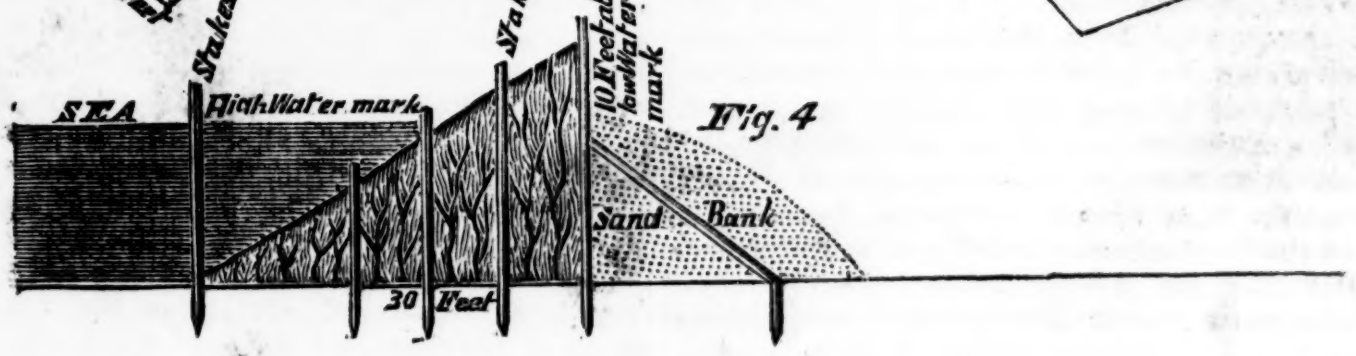


Fig. 2—A, Surface covered with turf or small stones.
B, sown with grass seeds.
C, Stake and rice.
E, Back drain.





Fig, 3—A, faced with turf,
Fig. 4—A, faced with turf,

quires to be frequently renewed; but where it can easily be procured, the expense is not great.

This much may suffice for the first branch of this Section. It is now necessary to give some directions respecting the embankment of such low parts of the coast, as are subjected to inundation, by the flowing of high tides. The land here alluded to is not those bare shores that are only left dry at low water, but the flat *links*, *salt-marshes*, or *sea-greens* (as they are variously called), composed of an accumulation of deposited mud of a rich quality, formed partly of the soil washed down from the upper grounds, and partly of such substances as are thrown towards the land by the tide. As these soils and substances accumulate, the surface rises so much in height, as only to be flooded by the highest spring-tides. Such have originally been the rich carses on the rivers Forth, Tay, and others, where, by embankment, and the gradual increase of soil by cultivation and manure, these extensive tracts are now become the most valuable and productive land in this part of the kingdom. The first thing to be observed, in embankments of this kind, is, to ascertain the exact height of the highest flood-tides, so that the embankment be raised, at least two feet above what these may ever approach to. When this is done, the level must be taken, and stakes fixed to the proper height, along the whole line to be embanked. Two frames of wood, of the exact form of the bank, should be made, and set up at the distance of twenty or thirty feet from each other, *exactly on the same level*, to guide and direct the height and dimensions of its construction; and the same level must be kept throughout the whole line. This is more requisite than in the case of rivers, that have a descent in their current, and where the height of the bank is regulated by the fall of the steam; for the surface of the sea-water, *being all on a level*, the top of the embankment requires to be exactly parallel to the horizon, without a rise or declension in any part.

As the pressure of the water upon an embankment against the tide, is different from that in the current of a river, it is not necessary to have it so straight, or of that uniform smoothness, which is requisite where a running stream is to glide along the side of it. It is unnecessary, however, to give it such turns and windings, or to embrace all the points and indentures of the verge next the water, which would lengthen its course, and increase the expense; but it may be carried as near the edge of the land as it is possible to obtain a safe and permanent foundation for the bank. Where it crosses any creeks or hollows, formed by the agitation and working of the tide, or by runs of water from the land, it will be necessary to increase the width of the base, in proportion to the depth at such places.

In forming the bank, the breadth, height, and strength, must be made in proportion to the depth and weight of water it may have to resist; and, in order to obviate resistance, and to lessen the pressure, the more the slope towards the water approaches to a degree of flatness, the greater will be the firmness and durability of the structure. In difficult cases, it is advisable that the surface next the water should form an angle to a perpendicular line, of from forty to sixty degrees, according to the force to be opposed, and the nature of the materials of which the mound is to be constructed. See Fig. 2. of Plate I. Where the foundation is firm and solid, the natural earth of the ground where it is erected may be employed; and will answer perfectly well for the body of the bank, and for the inner surface likewise; and where the pressure or force of the water is not very violent, the slope next it may be formed of the same materials. But in cases where the force of the tide and waves, by its exposure to strong winds, operates more violently against the bank, the outer slope should be formed, to the depth of two feet, with clay, or the strongest earth that can be most conveniently got; and that, as well as the top, covered with well swarded turf. The inner slope, or that next the field, may be sown with grass-seeds.

The stuff, for forming the bank, should be mostly taken from the side next the water, that as little of the surface within may be broke as possible —only by what is taken from the back-cut, or drain, that is necessary along the embankment on that side.

No stones should be left near the foot of the embankment: for the tide, forming eddies round them, would soon make holes, and break through the bank. To guard the bank from the impression of the water, a fence, *of stake and rice*, may be made along the bottom of it next the sea, which will last till the surface on that side is sufficiently swarded, and the mound properly consolidated. Lastly, attention must be paid to diverting any streams, or runs of water that may pass through the ground embanked, and to collect these, if possible, into one or few channels, and to give them an outlet at the lowest and most convenient part of the bank. This must be done by a sufficient tunnel, box, or pipe, according to the quantity of water to be discharged, and which must have a proper flood-gate or valve, fixed to the mouth of it by hinges on the upper side.

SECTION II.

On reclaiming land from the sea, by embankment.

It is necessary to premise, that, under this head, are included those rivers that have broad estuaries, and where the tide flows for a considerable way, leaving dry, at low water, extensive shoals, *sleeches*, or tracts of surface, which it is in the power of embankments to exclude from the tide; and where the quality of the surface is such, that, at no extraordinary expense, it may be reclaimed and converted into arable soil. Such are the Friths of Forth, Tay, Clyde, Cree, Beauly, &c. where great acquisitions of land might yet be made, at a moderate expense.

The first object to be considered, before attempting to reclaim land which at low water is left uncovered by the sea, is, whether or not the quality of the surface to be gained is such as to be capable of cultivation, and fit for the other purposes of agriculture; for, in many cases, what is exposed at low water, and might easily be banked out, is an accumulation, to a great depth, of barren sand or gravel, unfit for any useful purpose.

On many parts of the coast, however, where the sea at low water recedes so far, as to leave dry large portions of surface in the bays and creeks of the shore, the soil is of a rich and fertile kind, being rather a deposition of fine earth washed down from the land, than of poorer substances

thrown out by the sea. In the friths above mentioned, and at the entrance of other large rivers, whose estuaries are wide, and in which the tide ebbs and flows, immense tracts are left bare at low water, and where the land that might be gained would amply repay the expense of embanking it. The mouth of the South Esk, in the Bay of Montrose, deserves particularly to be mentioned, as one of the most extensive and practicable instances of this kind. Indeed, this tract was undertaken to be embanked by Dutchmen, many years ago; but owing to a dispute amongst the proprietors, respecting their rights and boundaries, the undertaking was abandoned. On the other rivers that have been mentioned, much has already been done, and there is now land let at five pounds sterling per acre, that, not many years ago, was covered to a considerable depth with water.

At the mouth of the Eden near St. Andrews, much land has, of late years, been reclaimed; and much may still be gained there, by extending these embankments, on a *stronger* scale, farther into the tide-way.

Where it is intended to reclaim a piece of land that is covered every tide, either in a bay of the sea, or on the side of a large river, where the tide ebbs and flows, the undertaking will be more or less difficult, according to the depth of water, rapidity of the current, and prevalence of the winds in that quarter. Embanking, so as to exclude the sea in these situations, will also be more or less tedious and expensive, according to the nature of the materials of which the beach is composed, whether the soil is of a sandy or loose texture, which is most frequently the case; or of a clayey substance, where there will be less labor in its construction, and more certainty of its remaining secure.

Where the materials on the spot, of which the bank is to be formed, are of a sandy consistence, it is absolutely necessary to face it with stone on the side next the sea; otherwise, the impression of the waves would soon make breaches in it, and overturn the whole, in the course of a few high tides. It is necessary to give it a very considerable slope, and, at the foundation, to have the stones bedded and laid so that they bind well together. The height of the embankment should, in all cases, be two feet more than that of the highest tide. Fig. 3 of plate No. 1. represents the section of an embankment of this kind.

Where the materials of which the bank is formed are of a clayey or adhesive nature, strong turf may answer the purpose of facing the bank, and these should be well beat and pinned down as soon as laid. With regard to laying the turf, Mr. Beatson observes—"The inside slope should also be faced with turf, which may be laid with the green side downwards, as in building any common sod wall. Some expert sodders can finish this kind of work extremely neat, by setting the sod on edge, according to the slope intended to be given, and with proper mallets and beetles, they ram the earth hard behind, which consolidates the work as it advances, and tends very much to its durability. When the first or lower course is finished, they pare the upper edge of the sods with a sharp knife, quite even, by laying a rule to them, and then they go on with the second course, which they finish in the same manner, and so proceed till the whole height is completed' which, when finished properly, looks very beautiful and smooth, not a joint between the turfs being seen."

"If turf is to be used in covering the outside slope, it must all be laid with the grass uppermost, and well beaten down with a flat sod beetle made for that purpose; and for their better security, it may be proper to drive a small stake of about eighteen inches long, or more, through every sod. The sods for this purpose should at first be carefully taken up, and traced by a line, all of the same breadth, and their edges cut as even as possible, that they may make the closer joints, which will tend very much to their security till they grow properly together."

In some sandy shores, embankments may be made entirely of wicker-work. Three or four rows may be made, of different heights, and the intervals betwixt them filled with brushwood, furze, &c., forming a slope towards the water, as shown by Fig. 4, in plate No. 1. These materials would collect and retain the sand, as the tide passed through; and this accumulating and consolidating, would in time rise in height, so as to exclude the influx of the tide at all times.

When the sea is found to encroach upon a low shore, it will be proper, before attempting to execute any regular embankment, to make a careful survey of the coast which is injured, in order to ascertain if there be any local circumstances that can help to raise a natural barrier against the encroachment. Every person must have observed, that in many places the sea is continually stirring up, and driving against the coast, quantities of sand and other materials, which either remain, and serve to form either small hills or flat downs; or, are carried back by the ebbing of the same tide which brought them. In general, where the materials are of a more adhesive and solid nature, as shells, plants or slime, they rest and accumulate, and raise the land above the danger of any encroachment from the sea. But where the shore consists entirely of sand, whatever quantities may be pushed forward at each tide, are immediately dispersed to and fro by the winds, and the shore remains open and exposed to every high swell of the sea. In such a case, however, as this, means may easily be adopted for collecting and fixing the flying particles of sand; and it is certainly proper to prefer so economical an expedient, to an expensive regular embankment.

From an account of a work of this kind,* performed upon the estate of the Earl of Ashburnham, at Bembrey in the county of Caermarthen, useful information may be obtained of the manner in which such bulwarks ought to be raised.

Mr. Tatlow, who suggested the expedient in this case, and carried it into execution, remarks, that for many years the sea had been making encroachments; "and, particularly, in October 1795, had broke in and covered many hundred acres, damaged the houses, buildings, stack-yards, and gardens; and it was the general opinion, that a regular embankment must be formed, which would cost some thousand pounds, the Earl having several miles of coast."—The view," he proceeds, "that I first took was, upon a very windy day, and the shore an entire sand, which extended at

* Communications to the Board.

low-water many miles. In riding along, I perceived that any piece of wood, or accidental impediment to the course of the sand, raised a hill: it immediately occurred to me, that by making a hedge at the weak and low places, with wings to catch the sand as the wind blew it in different directions, I should obtain the desired effect. I therefore directed stakes, nine feet long, to be cut and drove one foot and a half into the sand, at two feet and a half distance from each other; betwixt which I had furze interwoven, so as to form a regular furze hedge, seven feet and a half high. Of this, since last June, I have done eleven hundred and thirty-seven yards; and in October last, when I was there, a great deal of the hedge was covered: and since that time, I am informed by letter, that a great deal more of it is so, and that the neighboring inhabitants draw great comfort to themselves, from the security my furze embankment gives them, as its present appearance plainly evinces, that, at a trifling expense, I can secure Lord Ashburnham's estate from being inundated; for whenever the first hedge is not high enough to prevent the sea overflowing, another may be built upon the sand formed by that hedge, and so on in succession, till it is perfectly safe."

Even when a regular embankment is required against the sea, it is proper, a year or more before it is erected, to fix fascines of brushwood down in the clay, by strong palisades, in the line in which the bank is meant to be raised. By this line, the mud and vegetables, which would otherwise be washed away, are arrested, and a most valuable addition made to the soil.

In raising regular embankments to exclude the sea from low tracts of ground, it is necessary to distinguish between those cases in which the water only overflows during spring-tides, and those in which the land is covered every tide. In the one, the operation is easy; but in the other, attended with considerable difficulty.

When the land is only overflowed during spring-tides, there is time in the intervals, either to complete the embankment required, or to finish it in such a manner, that the flowing of the tide can do it no injury. But if the sea ebbs and flows every tide upon the land which is to be reclaimed, only small pieces of the work can be executed at a time, and the force of the water, at the flowing of each tide, is apt to destroy all that has been previously performed.

In either case, when only a part of the embankment can be executed before the return of the flood, it is proper that what is done should be done in a finished manner. Thus, supposing a length of thirty or forty feet, or yards, can be completed in one tide, it is better to raise it to its intended height, and to face the slopes well with turf, than to commence a greater extent of bank, and leave it in an unfinished state, exposed to the violence of the waves. It may be further remarked, that in low-flooded lands of the kind under notice, there are always several hollows or water-runs, formed by the regress of the tide; and where the embankment has to be executed in different portions, it may be proper to build in the first place, across the spaces between these water-runs, so that the sea, having its usual channels of evacuation left open, will have the less tendency to injure the work. The spaces, thus left unembanked, may be filled up during the intervals between spring-tides.

All the inconveniences, however, which arise from the interruption given by the sea to the progress of building embankments, may be effectually avoided by the following plan, devised and explained by Mr. J. London, the ingenious author, compiler, and editor of many useful books:—

"Let triangular trusses of wood be prepared and placed at low water, surrounding a part of the foundation of the proposed embankment; the hypothenuse or sloping side of the trusses fronting the side all round, which side is next to be covered with boards, say about five feet broad, twenty long, composed of deals neatly joined; and one board is placed upright to prevent the spray from coming over; or, the trusses being placed and fixed upright by cross rafters, the whole may be laid over with single deals, without being closely joined, and then covered with oiled canvas or pitched sailcloth, neatly fastened on, and cemented at the joinings with a composition made of tar and clay; and this will be a more economical mode.

"The barrier being thus constructed and placed, it is evident, that as the tide flows, the water will surround it; and the higher it rises on it, provided it does not rise higher than fifteen or sixteen feet (about the general height of spring-tides), it will only press it down the more, and render it firmer than it would be, if only half of it were covered with water.

"If the embankment is to be made of clay or earth, or the same materials upon which it is founded, a space must be inclosed of sufficient width to allow these to be dug out from the land side of the bank; or if it is to be wholly built of stone, or any distant material, these may be laid down beside, or upon, the spot to be built on, before it is surrounded by the barrier.

"When the length of the wall contained within one of these enclosures is finished, the barrier must be moved along, so as to take in another space, which must be built upon as before. The barrier must then be again taken down and replaced, &c.; and so on, until the whole line of embankment is finished.

"The original expense of this barrier may be from £100 to £400, and it may be moved and replaced for twenty or thirty shillings each time; and as the wood of which it is made will generally be of considerable value after the bank is finished, the total expense of this barrier will not be so great as at first sight may be imagined.

"By means of this barrier, it is evident, that embankments may be made as far out as the sea retires; and even beyond that, buildings of any kind may be constructed within it, with ease and safety. The only additional expense, when the barrier was placed *among* water, would be that of pumping it out, which could easily be accomplished by a wind-mill, or any other such simple contrivance."

In some instances, where the sea overflows the piece of land to be reclaimed, to a great depth, a different mode of operation from any that has been described, has been adopted. The line of embankment being marked out by poles, quantities of stone and clay mixed, are conveyed in flat-bottomed boats or punts, and thrown overboard, until a bank is accumulated. This mode, it is believed, is common in Holland.

The materials of a proper bank, and the mode

of constructing them, have already been explained. Its elevation and slope should depend upon the degree of exposure to the winds and tides, and the height to which the greatest tides are accustomed to rise. The elevation may vary from five to fifteen feet, and the front slope from twenty inches to five feet for every foot of height; the back slope being generally one half less than the other. In every case, the bank should be at least two feet higher than the water during the greatest spring-tides. In determining the slope, great care must be taken to proportion it to the force of the sea, as nothing can be more ruinous than to make the bank too bold or upright. It has been well remarked, that a wave which falls on a flat surface dies without a struggle, while one that is stemmed by an abrupt rock strikes with tenfold force. The evil of not estimating properly the force of the sea, is remarkably exemplified in the case of some extensive embankments at the mouth of the river Cree, in the county of Wigton. The banks on both sides of this river were made of the same dimensions, being about four feet and a half high, and nine feet broad in the base, without adverting, that the northern bank is exposed to the south-west winds, which in that quarter always bring up the highest tides. It happened, accordingly, that at the first high tide, the embankments on the northern side were almost totally destroyed, while only a few breaches were made on those of the southern. To have enabled the former to withstand the superior force which assailed them, the dimensions ought perhaps to have been double those of the latter.

Along the back of all sea-banks, trenches should be made in the same manner as in river embankments, and sluices erected at different parts, to shut of themselves against any external water, and to open when the tide ebbs, to let out any water from within.

In every case, where an external valve is required for the discharge of the surface-water of an embanked area, and where it is liable to be choked up with sand or gravel, as behind a shifting beach, or in front of the open sea, means must be taken to defend the valve from stoppage, or great attention be given to keep it clear. In some situations, the valve is so liable to be buried, and the channel closed up, by every spring-tide, or gale of wind, that the only effectual remedy is to make a covered channel through the line or ridge of the beach into the sea; and this must be made strong enough to sustain the weight of the heaviest breakers. This expedient has been adopted upon Lord Cawdor's estate in Pembrokeshire; and though found extremely expensive, yet the advantage gained is so great, as to render the undertaking profitable. In cases of less extremity, the valve might be sufficiently guarded by a pile fence or a pier, carried out from the foot of the embankment, across the known drift of the beach, the sand, which might accumulate behind this fence, being removed from time to time. Where the sea reaches to the foot of the embankment, it has been found necessary to erect two flood-gates, the one within to secure the outfall channel, and the other on the outside to ward off the waves, and prevent them injuring the inner works. The outer gate may in this case be lifted; but though a considerable quantity of water should be admitted, yet its force being broken, the inner valve will remain undisturbed.

It sometimes happens, that salt marshes, particularly those at the sides of estuaries, are situated so low as to lie constantly under water. In cases of this kind, the following mode of drainage and embankment, practised on a marsh near Marazion, in Cornwall, may with propriety be adopted.

The marsh in question was situated on the bank of a river, and separated from the sea by a tract of sand consisting of about seventeen acres. It lay always under two or three feet of water, and the sea flowed over it at spring-tides. As it was found impossible to take off all the surface-water by the river, a square wooden pipe of nine inches diameter was carried through below the tract of sand above mentioned, from the edge of the marsh to that part of the shore called *half-ebb*, which was eight feet lower than the surface of the marsh. At the mouth of this pipe, a reservoir, of 18 feet square and eight feet deep, was cut out, and from this reservoir a trench of three feet deep and five wide was extended on each side, between the sandy soil and the marsh. At the distance of every sixty yards, cuts were made from this main trench across the marsh, by which the whole area was divided into oblong square fields. By means of these trenches, all the surface-water was conveyed into the reservoir, and from the reservoir conducted by the pipe into the sea. At both extremities, the pipe was guarded by valves, which shut at the approach of the tide, and opened upon its regress, to let off the water which had collected in the interval; and before the valves, iron bars were also placed, to prevent the intrusion of extraneous bodies. When the surface-water of the marsh had been thus removed, a strong embankment of turf was erected on those sides of the marsh where it was exposed to the influx of the sea; and, by a judicious course of management, the ground became, in the course of a few seasons, covered with rich crops. The reporter remarks, that the whole of this improved ground, including the marsh, the sand tract next the sea, and a piece of croft or elevated ground behind the marsh, "has been productive of considerable advantages to the public, particularly to the poor. Four hundred persons yearly receive turf from it, two hundred and fifty are fed most plentifully with potatoes, which are planted here by very poor people, who are, in consequence of having land given them, become uncommonly industrious; and the whole neighborhood, by its drainage, have got rid of low nervous fevers and agues, with which it was commonly pestered."

The tracts of salt marshy ground, which have been reclaimed in Scotland, are not very numerous; but it is hoped the profit which these have afforded, may tend to induce further exertions in this branch of improvement. Perhaps there is no place in which more valuable acquisitions have been made in this manner, than in the island of Islay, under the direction of its intelligent proprietor, Mr. Campbell of Shawfield. At the head of an arm of the sea called Loch Gruinart, an embankment has been executed, by which four hundred acres of land, which formerly composed an useless salt marsh, have been brought under the plough. In making this embankment, it was found that a considerable stream, which discharged itself into the head of the loch, impeded the operation of the flood-gates; and, as the only effectual method of removing this serious incon-

venience, Mr. Campbell had recourse to the expensive and arduous expedient of totally reversing the course of the stream, by withdrawing it from its old channel, and leading it through the opposite side of the country into Lochindaal. The whole of this embankment was executed in one summer. The total expense was about £600. The ground which was reclaimed was let at an additional rent of £235; so that, estimating this at thirty years purchase, the immediate gain by the embankment was £7050 sterling. Mr. Campbell has finished a similar embankment against the sea at the head of Lochindaal.

Along the shores of the Forth, some important acquisitions may also be noticed. "The whole tract of land," says the reporter of Stirlingshire, "which stretches along the Forth, appears evidently to have been covered, at some remote period, with the waters of the sea, which, gradually retiring, have left this soil the richest in Scotland, exposed and fit for the operations of agriculture. These carse lands are very little elevated above flood-mark; and all along the coast the frith is so shallow, that, at low water, many hundreds of acres are left dry, the soil of which, when recovered from the sea by embankments, is equally valuable with that which had been long under cultivation.

"The idea of recovering this fertile soil from the sea, seems to have been originally suggested by a Dutchman, about the beginning of the last century. In the parish of Borrowstounness, he proposed to acquire by this method a tract of two thousand acres, upon condition of his being allowed the possession of it for forty years, and timber from the woods of Kinneil necessary for erecting the dikes. The proposal was rejected. Had this proposal been accepted, it is evident, that, at the current rent for which such lands are now let, the proprietor might have enjoyed at this day an additional income of £10,000 a-year.

"The proprietors of the adjacent shores in Stirlingshire have at length awakened to a just sense of their interest in this important species of improvement. A considerable deal *has been done* in embanking, but much more *remains to be done*, in the parishes St. Ninian's, Airth, Bothkennar, and Falkirk."

The number of acres of carse soil lately recovered from the Frith of Forth in Stirlingshire alone, has been ascertained as follows, viz.

	Acres.
Reclaimed by Lord Dundas, - -	200
" by the Earl of Dunmore,	200
" by other proprietors, -	200
	600

Thus it appears, that within these few years, there have been recovered, in one district alone, by embankments against the sea, no less than six hundred acres of the richest soil in Scotland, now let at five guineas per acre.

On Lord Dundas's estate, five hundred acres more may be easily reclaimed in the same manner. The writer of this Treatise has inspected the ground, and seen the estimate of a respectable undertaker, which shows that the expense would not exceed £20 per acre. Thus the whole expense would amount to about £10,000; and the return, at the ordinary rent of £5 per acre, would be £2500 a-year, or about four year's purchase of the soil. Two hundred acres more of the same quality adjoining it, might be recovered at a similar expense.

On Lord Dundas's estates of Clackmannan and of Bambriech in Fife, a considerable extent of land has also been embanked from the overflowing of the rivers Forth and Tay, and is now let at £5 per acre. On the estate of Kincardine,* adjoining that of Clackmannan, similar successful embankments have been made; and it is proposed to extend these still farther into the channel of the Forth.

Besides the private emolument which would accrue to individuals from the spirited prosecution of these embankments, a very important public benefit would also arise. Were they completed, the navigation of the Forth and Carron would be greatly improved; the waters of the frith, which are now spread over a large surface, would be confined within a narrow channel; and the depth would be so much increased at full tide, as to admit vessels of a larger burden.

Wherever, on the other hand, these embankments are neglected, the sea is gradually gaining upon the land, and washing off the most valuable soil; a striking instance of which has been observed to the north of the confluence of the Carron.

But there is reason to hope, that many years will not be allowed to pass, till, on the shores of Stirling, Linlithgowshire, and many others, there shall be added many thousand acres to the carse soil of Scotland.

The Duke of Hamilton, some years ago, engaged in the embankment of about 300 acres on the estate of Kinneil, near Borrowstounness; but after two years' trial the attempt failed. It is, however, perfectly practicable, if the proper plan were prosecuted, which it is hoped, the present enlightened proprietor will not hesitate to carry into effect.

It is a fact worthy of remark, that all along the shores of the Forth, the sleech has increased very much, and is increasing every year, by the accumulated deposition of moss brought down from Blair-Drummond, by the floating it away from that extensive tract, which has undergone so great improvement since the commencement of that operation by the late Lord Kames. This is one great inducement to the prosecution of that scheme of embankment, which is so practicable all along the course of that river. The land that has lately been embanked by Lord Dundas, (according to a plan, and under the direction of the author,) was, fifty years ago, covered to the depth of nearly thirty feet at high water, where the depth would not now have been more than five feet at the highest tides, owing to the gradual deposition of the floated moss.

The banks of the Clyde present, in the same manner, more striking instances of what may be done, than of actual improvement, by embankment. The following example deserves notice, as it shows both the facility and cheapness with which such works may be raised, and the petty interests which too often impede and defeat the best

* Belonging to the Countess Flahault.

schemes of improvement:—"From a charter granted to the burgh of Dumbarton, in the year 1609, it appears, that a great part of the lands belonging to the community had been recently overflowed by an inundation of the Clyde and Leven, and even the foundations of many houses and gardens overturned. No less than 37,000 merks Scots (a large sum in those days) is granted "for the purpose of erecting *dikes* or *bulwarks*, to confine the river Leven within its old bounds." Though vestiges of a mound of large stones are still discernible, and afford proof that some attempt was made to reclaim the land thus lost, the attempt appears to have been unsuccessful. The whole common, extending to about two hundred acres, is often nearly overflowed. Even the highest part of it is insulated every tide, and the remainder consists of bare sand, covered with water twice a-day. The only use to which it is put, is pasturing a few cows belonging to burgesses, with which it is at all times greatly overstocked, yielding a trifle to the town's treasury, and not much profit to individuals. About the year 1788, Mr. Whitworth the engineer, who superintended the finishing of the Forth and Clyde Canal, was employed to survey this piece of ground, with a view to its being embanked. He accordingly made out a profile of the embankment necessary, with an estimate of the expense; which, after making an ample allowance for unforeseen accidents, did not exceed £1400. This would have amounted to no more £7 for each acre; but though it should have cost double that sum, it would have been a trifling price for such excellent land, created, as it would in a great measure have been, by this operation. The plan, however, has not been carried into execution, owing probably to the narrow revenue of the burgh, and the difficulty of satisfying the claims, and reconciling the competing interests of the burgesses, many of whom would not readily consent to relinquish their ancient right of pasturage, or exchange the insignificant profit derived from it, for the contingent benefit resulting from the melioration of the common on which it is exercised. It is scarcely probable that it will be set about in earnest, till a recurrence of violent floods and high tides, which former experience has shown to be not impossible, shall endanger the existence of the town, and compel the inhabitants to unite in this work as a measure of self-preservation."

The last branch of sea embanking, of which it is necessary to take notice, is that for recovering tracts of land, unnecessarily occupied at the estuaries or mouths of rivers. In consequence of the regorging action of the sea, all streams spread greatly at their mouths, and the earth they bring down is deposited there, and accumulates into shoals and islets. The soil which is thus formed, is invariably of the richest kind, and the recovery of it becomes of course an object of proportional advantage.

The most advisable and effectual plan for this purpose, when it can be executed at a remunerating expense, is to alter the course of the river altogether, and make it discharge itself at some new point of the coast, where the land that would be occupied by its channel, might be of less value, and its discharge less exposed to be choked or shifted by the regorging action of the tide. Where this has been done, it has been found, that the old channel, in the course of a few years, was filled up, and the sea quite excluded. If such a complete change cannot however be effected, the whole river should be collected into one stream, the channel should be deepened, to make the water flow with celerity; and embankments should be raised on each side, to prevent it from spreading in future, over a space that may be converted into useful land.

PART II.

EMBANKMENT ON RIVERS.

SECTION 1.

On protecting land from the encroachment of rivers, by defending and securing their banks, &c.

A river that flows in a confined channel, is apt to commit ravages on adjoining land, by the continued action of the stream gradually breaking down, and carrying away the banks. where they are of a soft, loose, and friable or penetrable nature. The danger of the soil being carried away in floods, is increased or diminished, according to circumstances; such as the form of the banks; the nature of the soil; the rapidity of the current; and the quantity of water that, after floods, lodges on the margin of the banks, or falls over them into the river.

When the banks of a river are perpendicular, or nearly so, if the soil be of a sandy or mouldering quality, the danger of their being washed down and carried away by floods, is greater than where they slope gently, from the surface of the field to the bed of the river. But, if the soil and sub-soil be of a clayey or adhesive loam, and the current presses equally, and not more upon one part than upon another, a simple and efficacious improvement may be made, by sloping the bank so, that it forms an easy declivity, from the surface of the field to the bed of the stream. This slope soon becomes closely coated with grass, and the water, by gliding gently along, is in no danger of making a breach or encroachmeent nt in any part of it.

As a proof of this, it always appears, that wherever there is a gradual slope upon the bank of the river, and the grass growing upon it naturally, that the greatest flood makes no impression, nor does it any injury; as the water passes over it gently; and, not being confined or opposed, has room to expand. On the contrary, when it comes against a ragged or abrupt bank of earth, it soon undermines, and brings it down in great quantities. This is so obvious to the slightest observer, that it is astonishing so simple and easy a remedy should not be resorted to, in all cases where the banks are of this last description.

A stream of water having naturally a greater inclination to recede from, than to surmount the obstacles it meets, it always takes an angular or serpentine course; and it is in consequence of the river thus dashing from side to side, that injury is done to the banks. Were a river to flow in a straight line, or nearly so, which it would invariably do, if not interrupted, it would make no encroachment on its banks.

Ths most effectual remedy, in such cases, must, therefore, be to *straighten the course of the stream.*

This is an operation, which, in respect of natural circumstance, might in many cases be perform-

ed with little difficulty and expense; and, where most essential, usually with the greatest facility. But the smallest improvement of this kind, is in general rendered impracticable by minute divisions of property, and other attendant causes. A river is considered to be so far a common subject, that while a proprietor is entitled to take every natural advantage of the stream in passing, he is interdicted from executing any operation upon it, which can prove injurious to the other individuals who possess lands upon its banks. For example, if. by ponds or dams, he throws back the water upon a superior property; or by juttees, directs its strength upon the opposite bank; or by straightening the channel, makes the river rush with more than usual violence upon the inferior lands; he will commit an injury in each case, of which his neighbor has a right to complain. There is, in fact, in every situation, such a collision of interests, that it is seldom possible to reconcile them to any extraordinary alteration on a river; and above all, in so *direct* and *radical* a one as that of straightening the channel.

The case in which this measure may be recommended as most expedient, is that of those mountain streams which intersect the haughs, or hollows between the different ranges of hills or high lands. All these haughs are composed of soil of the richest kind, formed of particles of earth washed down from the heights; and thus are the most valuable portions of land, both in the low country and in the highlands. But, in consequence of the streams that intersect them being allowed to roam at pleasure, a great portion of soil is, in such instances, unnecessarily lost; and what remains is so constanly liable to be broken up and destroyed, that the produce of haugh lands rests altogether upon a most precarious tenure. To explain these facts, it may be remarked, that when a stream is permitted to *wander at will* through such hollows, it occupies, by its devious course, four or five times the quantity of ground which it would do, if carried in a straight line; that, in consequence of the angular outline of the banks, the water strikes against them with violence, and continually makes encroachments; and that, by the circuitous direction of the stream, and the turbulence which that occasions, the evil effects of every flood are greatly increased.

The advantages of straightening such a stream are, accordingly—1. That a great addition of valuable soil will be obtained; 2. That the stream will be rendered more placid; less capable of doing injury to the banks; and less extensive in its inundations, and in its ravages.

The execution of the operation is moreover much easier in this than in other cases. The streams which takes their course through haugh lands, are in general nearly exhausted, sometimes enirely so, during the summer months; so that an alteration of the channel at that period of the year may be accomplished with comparative facility. And further, the soil, as well as substratum of haugh lands, consists generally of loose and incohesive materials, which are easily dug out and removed.

The great object, in improving the course of a haugh stream, should be, to lead it as straight forward as possible. If the haugh be winding, or there be obstructions, which prevent a cut from being made in a straight line from the entrance to the outfall, the stream should be led from to side of the haugh in straight reaches; always endeavoring to make some prominent rock, or point of sufficient firmness to resist the current, the vertex of each angle; or, where such cannot be found, raising an artificial bulwark of stones in its place; it may be led along the foot of the bank all the way, by which means the haugh will be kept entire, and the natural bank will be a barrier on the one side; and the earth thrown out of the cut, will be sufficient to form an embankment on the other, and to fill up the old channel also.

When a new channel is designed to be cut, its breadth may be less than that of the old, while its depth ought to be greater; because the narrower and deeper a channel is, the water always flows with greater ease and regularity. The lines of the intended banks being marked out, the earth should first be dug out from the middle of the inclosed space, to the full depth proposed; and on each side, the depth of the excavation should be gradually lessened, so as to form a convex slope to the tops of the banks, this form being of all others the best fitted for diminishing the pressure of the water, either in ordinary or extraordinary floods.

To secure the new banks against the action of the stream, they should be carefully faced with stones or turf. The former compose the best defence, and may, in most cases be employed; as abundance of stones is generally to be found on the banks of mountain streams. At the bottom of the facing, the stones should be of the largest sort, and sunk well into the ground, to prevent the water from uudermining them. In carrying up the rest of the wall, the stones should be laid *endways; i. e.* their inner ends pointing to the same centre like the stones of an arch, and earth or gravel should be rammed firmly in behind, as the work proceeds. Between the stone-work and the green sward on the top of the bank, there should be several layers of thick tough sods or turf, which will not only serve to bind the stones, but make the junction of work with the natural bank smooth and compact. When the whole facing is executed, the stones and sods should be forcibly beaten into the bank with mallets and rammers, in order to make it more firm and secure. If any fissures still appear, long splinters of stone should be driven in, which will not only fill up the vacant spaces, but act as wedges to fasten and consolidate the rest of the work. When sods are employed to make the facing instead of stones, the foundation ought at all events to be defended by large stones; and it may also be proper to drive a single or double line of stakes into the bank to prevent the current from tearing away the sods, or even disarranging the stones.

In the case either of stone or turf facings, it has been found useful to scatter a quantity of coarse hay seeds over them; as they vegetate quickly, and tend greatly to fasten the work The firmness of the bank may also be considerably increased, by setting willows or other aquatic plants along the top. *

The most difficult branch of the whole operation, is that of leading the stream out of the old

*These should never be allowed to grow up as trees; but be cut over occasionally, so as their roots may spread, and they may not be shaken and affected by the wind.

into the new channel. When the mouth of the new cut can be made to fall in with a bend of the old channel, the change may be made with comparative ease, as the current will flow into the new channel in a straight line. In this case, the materials dug out in forming the mouth of the new cut, may be sufficient, when thrown across the old stream, to turn its course. But if the alteration of the channel be abrupt, and the stream strong, it will be requisite to raise a pier of stone upon the bank of the old channel, to direct the current forward to the new one; a water-tight dam being formed between the point of the pier and the new bank.

The materials dug out from the new channel may either be employed in filling up the old one, and thus facilitating its future conversion into arable or pasture land; or if the stream be liable to high floods, they may be used in erecting embankments on each side of the new channel.

In the case of *vale* rivers,* the expedient of straightening the channel is equally advisable, though not so easily practicable, as it is upon *alpine* streams. In the latter case, a cut three or four feet deep may frequently suffice, and stones for erecting piers, and facing the banks, are found in abundance; while in the former, a depth of from six to twelve feet is sometimes necessary, and stones are not obtained without considerable difficulty, There may, nevertheless, often be situations where the extent of ground to be acquired by a new cut through a valley, will amply repay every expense and trouble attending the operation.

Of many similar instances, the following is one, where nearly 1000 acres have been secured in this way, at a very trifling expense; and, as a particular description of it may be useful, in directing the execution of operations of the same kind, it is given at length. In the parish of Kilsyth, Stirlingshire, the river has its course, for upwards of four miles, over a plain of small declivity, and of a soft loamy soil. It formerly straggled in many directions over this plain, in a channel of very little depth. At every turn it took, it was gorged up into a pool, and was overgrown with aquatic vegetables. At every flood, the whole valley presented the appearance of a lake; the hay and corn harvests were frequently ruined; and several fields, naturally of a rich soil, were rendered incapable of cultivation.

About the year 1793, Sir Archibald Edmonstone, of Duntreath, Bart. who was proprietor of the lands on the north side of the river, for more than four miles, employed Mr. Whitworth, an eminent engineer, to form the plan of a new cut sufficient at all times to contain the waters of the river, and as nearly in a straight line as the situation of the grounds and the course of the river would admit. To induce the proprietors on the south side to join in this useful undertaking, he generously offered to lay out two-thirds of the expense himself. So slow, however, are persons of unenlightened minds in discerning their own interest, that only a few of them, at that period, acceded to these advantageous terms. During the first year, only about a mile and three quarters of the new cut were executed. But the advantages of this partial improvement soon become so obvious, that the greatest part of the conterminous heritors concurred with Sir Archibald, in prosecuting the plan, though not altogether upon such liberal terms, as a just sense of their own interest might have dictated. Early in the course of the second year, the cut was completed.

The dimensions of this cut were varied judiciously, according to the gradual increment which the river receives in its course. For the *first* mile from above, where the river is of considerable extent, it is from eighteen to twenty feet wide at the surface, by ten to twelve at the bottom. Throughout the second mile, it is from twenty-two to twenty-four feet wide at the surface, by fourteen or sixteen at the bottom. Throughout the the remaining part, it is about twenty-eight feet at the surface, by sixteen to eighteen at the bottom.

The first part of this cut was undertaken by the contractor at two-pence per cubic yard; but he was only bound to lay down the earth regularly at the distance of a yard from the cut, without any obligation to form it into a regular sloping bank. It was understood that the conterminous heritors would execute this part of the operation. As they, however, proved negligent in this respect, it was found necessary to enlarge the contract; and two-pence farthing per cubic yard was allowed for cutting, and for forming the bank. The low rate at which this contract was entered into, may be accounted for at this day, not merely from the facility of working in a rich loam or clay, but chiefly from the well-known, and by many severely-felt, depreciation of money at that period. Such a work would not probably be now undertaken for less than fourpence per cubic yard. The expense of the whole of this cut did not exceed £600.

The embankment on the sides of the cut is erected about three feet from the brink, and is, for the most part, somewhat more than three feet in height; and could contain nearly double the quantity of water than now runs in the new channel.

The improvement, which has been now described, has been productive of very important advantages in this naturally fertile district. The declivity or fall of the river, throughout the tract, is about eighteen feet. The waters which formerly, in their crooked course, were almost wholly stagnated, now run at the ordinary rate of the declivity which is given them. They never overflow their banks. Cattle can now pasture upon those grounds, in which they would have formerly been swamped. The surface of the water being now, for the most part, four, and sometimes six feet below that of the adjacent fields, this cut serves as a general drain to the whole valley; so that three hundred acres of meadow may be converted into arable land; sixty acres of moss may be converted into meadow; and five hundred acres of arable land are already rendered of double value.

If the windings of a river cannot be altered, either from natural obstacles, or from the opposing interests of proprietors—or if the expense of the alteration be such as to render it unprofitable—it becomes the duty of proprietors then to consider, how far the subsisting channel can be improved, so as to lessen the ravages of the stream; or what means can be adopted for guarding their own lands, without injuring those of their neighbors.

As the impediments a river meets are the cause

* Those flowing through holms, haughs, or meadows, in the *low country*.

of its being turbulent, the first and most obvious thing to be done, is to remove all heaps of mud, stones, trees, or bushes, which are collected in the channel, and obstruct the course of the water.

At those places where the river encroaches, the means which may be used to defend the banks are various. In some instances, bulwarks of stone, laid regularly in wooden frames, have been raised; but though such wooden frames facilitate the construction of the work, they prove ultimately injurious to it; for in consequence of being alternately wet and dry, they soon rot and give way, leaving wide gaps, through which the water enters, and breaks up the embankment. In some places, large sloping cauls, or structures of loose stones, have been employed; but where the extent of the bank to be defended is great, or timber scarce, such a bulwark is expensive, while it is at best only temporary.

Another method has been recommended by Dr. Walker, in his 'Economical History of the Hebrides.' as preferable to either of these:—"Form a single or double line of stakes in the bed, or on the bank of the river, of the branches of trees. These stakes may be from the thickness of one's wrist to that of man's leg; they are to be driven into the soil between two and four feet deep, and reach above the ground, or above the water a little higher than the rise of the greatest flood. They may be from six to twelve inches distant from each other; and if there is a double row, they are to be placed in the quincunx order.

"Such stakes, thus situated, can neither be displaced nor shaken by any force of water. They stop and entangle every sort of refuse brought down by the river. They intercept the mud and the gravel, which gradually form a bank, and force the river to establish a barrier against its own incursions—a barrier likewise far more efficacious and more permanent, than any that can be formed by art, with earth and stones.

"It is an obvious property of this mode of defence against the encroachments of rivers, that it is easily and quickly executed, and at a mere trifle of expense. A single cart load of such stakes, in some situations, might effectually preserve many acres of rich land. Every river, by the above method, may be thus turned and directed in its course at will. It would always be advantageous, if the stakes employed in this way were of the different sorts of willows.

"These take root, grow, and form a strong living fence against the river. But if stakes of willows cannot be provided, cuttings, or truncheons of willows, ought to be sunk in along with the stakes, and intermixed with them.

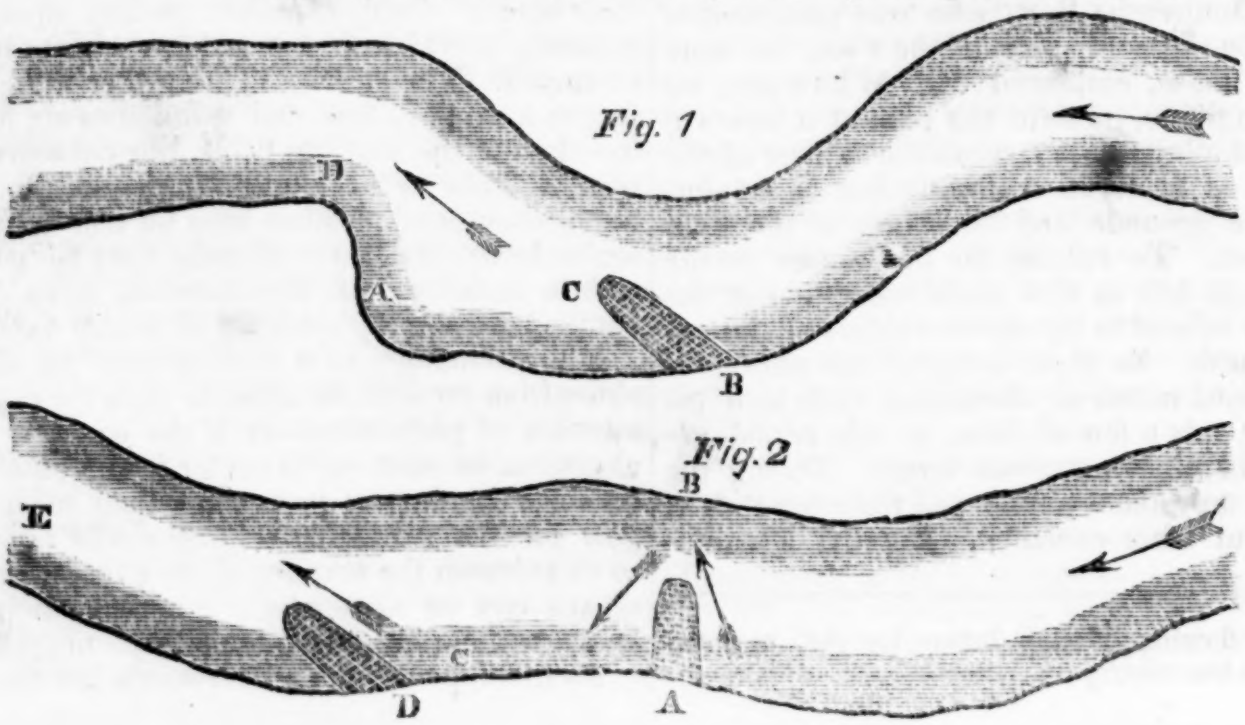
"For which purpose, the shrubby and low-growing willows are more proper than the mast willow, the osier, the crack willow, or any others which grow up to a tree."

This mode of defence is judicious; but the difficulty of executing it in a proper manner, may perhaps exclude it from general adoption. To enable the piles to withstand the force of the river, they must be sunk a greater depth into the ground than it is possible for any mallet to drive them. Dr. Walker mentions from two to four feet of depth as sufficient; but from the experience of others, it appear, that at least eight or nine feet is necessary, to render the piles firm; and to this depth they cannot be driven by any thing else than a pile engine, which in many situations it is difficult, and in all circumstances expensive, to procure. The inability of mallets to drive the piles, was particularly shown by the experiments of Mr. Miller of Dalswinton, upon the river Nith, in Dumfries-shire. In order to prevent the encroachment of this river upon part of his property, he drove in a number of piles at a little distance from the bank, and wattled them with the branches of willows, &c. The piles were driven with heavy mallets apparently firm into the ground; they continued so for some months, till a heavy fall of rain having swelled the river, the piles were undermined and carried away.

When there is an opportunity of executing a bulwark of piles properly, the method adopted by Mr. Miller, of wattling them with willows, &c. will be extremely useful in intercepting the mud and refuse brought down by the stream.

A more easy and effectual device, than any which has yet been mentioned, for defending the banks of a river, is that of stone piers or juttees. The object of these is, to throw off the stream from those places on which it threatens to make encroachments, to others where it can commit no injury. Thus, if a river be encroaching on one its banks at A, Fig. 1, of Plate II. a jutty of

PLATE II. *Plan representing Juttees for the defence of River Banks.*



stone, a little way up the river, in the direction B C, will direct the current towards D, and prevent any farther injury.

A jutty of this kind ought to be carrried out in an oblique direction, so as to force the current gradually towards the intended point. If formed too much at right angles with the stream, as at A. Fig. 2, it will throw the stream with violence on the opposite bank, at B, from which it will revert with double force upon C, the place immediately below the pier; so that, instead of diminishing, it would increase the destructive effects of the stream. But, if the jutty is placed obliquely as at D, it will force the current gradually towards E; in which position, one jutty may do more good, than several placed improperly at right angles. It may be further remarked, that when a pier is abruptly intruded into the natural channel, it requires from five to ten times more strength of structure than one which deviates gradually from the direction of the stream: in the one case, there is both the weight and force of the water, while in the other there is merely its weight, to withstand. And, above all, it is important to consider, that by making the pier in the direction prescribed, it cannot occasion any injury to the opposite bank.

The materials for constructing a guide of this nature, depend upon the magnitude of the stream to be directed. If it be small, a ridge of stones thrown loosely in may suffice; a barrier of this sort is both cheap and effectual, and when injured by any extraordinary flood, is easily repaired. When the land through which it passes is very valuable, and in the vicinity of a town, and the river is large and rapid, so that a pier of considerable height is necessary, it is proper if the expense be not excessive, to construct the pier of stone and mortar. In other situations, where masonry is too expensive, and the ground of less value, it may serve the purpose to employ casoons formed with piles and planks, or strong cases of wicker-work, and either of these filled with small stones or gravel, in order to give them stability; and they should be sunk along the edge of the banks, in as regular and firm a position as possible. These last expedients have been practised most successfully on several parts of the river Spey, and at Careston, on the banks of the river South Esk, in Forfarshire.

As the Spey is one of the most rapid and impetuous rivers in Scotland, and as the methods of embanking it is have been various and expensive, the following description of these operations, in its course through the Park of Gordon Castle, where it most ungovernable, may be useful in similar cases, and is given from the 'Agricultural Survey of the County of Banff.'

"It is believed, that the Spey first began to make encroachments on the skirts of the Park of Gordon Castle in September 1768, by the violence of the highest flood which tradition has kept on record. The first kind of embankments which were thereupon attempted, were expensive bulwarks of stone, built by the mason, but without motar. Their appearance, indeed, bespoke both efficiency and duration; but, like other fair appearances, "*it smiled deceitful;*" and, notwithstanding the continuance of expensive operations, the river, frequently levelling the works, maintained the contest with success, and on the whole, gained ground, when the opposing power was placed under the direction of the late Mr. Smeaton, who, on a brief survey, disapproved of all the costly bulwarks, and directed nothing more expensive than mounds of stone, loosely thrown together, almost at random, from the bed of the river, with no other art than to be raised higher than the water could, at any time, surpass, and to form a sloping shore, shelving back from the channel of the river. The embankments constructed on this principle, have been, almost to a wish, successful. The river, now is, as it were, entirely subdued; and the highest floods, although their violence in a thaw be exasperated by heavy masses of floating ice, hasten harmlessly along, dashing onwards directly into the sea.

"On some occasions there has been a departure in practice from Mr. Smeaton's theory, by forming a kind of mole of stakes, in collateral rows, to the breadth of four or six feet, driven firm into the gravel by the powerful repeated strokes of an appropriate engine. The stakes were bound together near the top by transverse bars, and supported by stones thrown in to fill up nearly all the vacuities. This kind of embankment was more expensive than the former, although the timber was furnished without price from the forest on the other side of the Park; and it was less efficient, because, instead of diminishing the power of the stream upon the gradual shelving of the slope, it was increased by direct accumulation against the perpendicular side of the mole; and, instead of adding any depositions of gravel, and turning the channel thereby to a greater disance from the shore, the torrent was brought to bear harder on the pile, and any gravel which had been left there before was swept bare off. The ordinary bed of the river was established along the course of this kind of pier; and it somehow not admitting easily of repair, brought the case into a worse state, almost, than it had been before.

"To render this kind of mole efficient, therefore, it would be necessary to add also the shelving slope of stone along the base of the pile, forming that gradually rising shore, which the river itself, on some occasions, exhibits, and which no power of the flood thenceforth ever injures; as if nature would thereby teach us the only secure mode of guarding against the robberies of the torrent." *

When the pier consists of masonry, it has been found prudent to throw in a number of large rough stones against the foundation, in order to prevent the stream from undermining it. Opposite to the head and outer point of the piers, piles should also be driven into the channel, to break the force of the water, and secure these important parts of the work from dilapidation.

There is another evil that piers are exposed to during floods, of which it is proper also to take notice. When the river surmounts the pier, the body of water which falls over, naturally scoops out a pit in the ground behind, and undermines the precipice over which it tumbles. This evil may be wholly removed, by raising the pier so high as to prevent any overfall; but this is a remedy too extreme to be often advisable. The most

* The author inspected these embankmets, and reported his opinion of several improvements, to the late Duke of Gordon, when making a survey for the drainage of the Huntly Estate, in 1811.

prudent plan is to endeavor to break the strength of the fall, or to shield the ground from its violence. For the former purpose, the back part of the pier may be made with a shelving or flatly inclining surface; for the latter, a strong convex floor paved with stone, may be made behind the pier, to receive the fall of the water. Of the efficacy of this last method, Mr. Marshall gives a strong example. * "Some ten or twelve years ago," he says, "finding that the foundation of a sea-wall, (or strong stone-facing against a wide open estuary), over which a large body of water, in times of floods, falls six or eight feet perpendicular, was constantly under repair, though every known expedient had been used to counteract the effect, I directed a convex floor nearly in the form of a shield, to be laid with strong rough stones, edgeway, its margins being secured with the largest stones, as butments to the arch; the broad end of the shield buts against the foundation of the wall, and receives the water on its stongest part, the point gently declining to lead off the water smoothly into the sea. It still remains perfectly firm; perhaps, indeed, firmer than when it was first put down." This is a case, where, its being a protection from the sea, it required more particular strength, and consequently would be more expensive, than what is necessary in the case of rivers.

The expedient of juttees, which has been already explained, is certainly preferable to any other mode of defending the banks of a rapid river, both in point of ease and efficacy, and deserves to be more generally adopted than it is. A strong instance of its superiority occurred in the case of the river Nith, formerly mentioned. After the piles which Mr. Miller raised had failed, he resorted to the use of juttees, and found them to succeed completely. Those which he has erected have a convexical slope on the side next the current, in order to diminish the pressure of the water, and strong planks are also firmly set on edge among the stones, their ends pointed towards the river; so that to commit the smallest injury; the stream must move the whole body of stones on the line of each plank.

Where a river flows slowly, and its banks are of a soft earthy nature, the mode of resisting encroachments should be different from, and will be less expensive than, any which has yet been mentioned. Let a large quantity of the smallest branches of trees, of broom, whins, brambles, or such-like brush-wood, be placed in the river, near the side where it threatens to encroach. If the river runs slow, they require merely to be thrown in; but, if its current is considerable, they must be stuck into the bottom, and fastened with stakes driven through them into the sides of the bank. This heap of rubbish intercepts the slime and mud of the river, which quickly accumulates towards the bank, and becomes a most effectual defence against any further encroachment in that quarter.

Such are the principal methods that have been successfully employed for protecting and securing the banks of rivers in Scotland, and which the writer has had an opportunity of observing. There may be other expedients; but these being of less efficacy, and only temporary in their duration, it is unnecessary either to describe, or recommend them to practice.

* On Landed Property.

SECTION II.

On the embankment of low ground on the side of rivers, to prevent inundation.

In those wide and extensive regions that lie under a warm climate, the rivers are generally *periodical* in their inundations, from the rains falling only at certain periods of the year; and the regularity of the floods is greater, in proportion as the rivers are extensive in their course. Thus the Nile, the Niger, the Pegu, the Ganges, the Euphrates, and the Plata, are distinguished for their regular and annual floods.

In these cases, an inundation, instead of spreading ruin in its progress, is the source of extraordinary benefit. The mud and slime which it deposits, form a regular supply of the richest manure. The soil is raised to the highest degree of fertility; and being constantly recruited, can never be exhausted. The inhabitants, too, being always aware of the precise time at which the inundation will take place, have it in their power to provide against its doing injury, and to prepare the ground for receiving the nutriment with which the water is stored.

But in countries like Britain, which are narrow in extent, overspread with mountains, and exposed to a variable and humid climate, the rivers are short in their progress, and liable to be *suddenly* swollen. A flood, then, invariably commits wide and severe ravages. Sometimes it entirely strips the land of its vegetable soil; at others, covers it with a thick bed of sand and gravel. Not unfrequently the water loses its usual course, and cuts a new channel through rich and cultivated fields; and the most disastrous scene of all, is to behold valuable crops, and sometimes herds of cattle, swept off by the flood, thus graphically described by the poet of 'The Seasons:'—

"Wide o'er the brim, with many a torrent swell'd,
And the mixed ruin of its banks o'erspread,
At last the rous'd-up river pours along;
Resistless, roaring, dreadful, down it comes,
From the rude mountain, and the mossy wild,
Tumbling through rocks abrupt, and sounding far;
Then o'er the sanded valley floating spreads,
Calm, sluggish, silent."*

The flat *haughs* (as they are called in Scotland), or low ground, lying on the sides of rivers, and particularly near their entrance into the sea, are, for the most part, composed of the richest and most fertilized particles of earth, brought down by the stream from the adjacent country, through which it flows. These, from their situation, are often exposed to devastation, by their banks being encroached upon, and carried away in time of floods, whereby a portion of valuable soil is lost, and a bank of sand or gravel lodged on the opposite side, in its stead. But, besides the gradual injury which the adjoining land sustains (which

* In a highly embellished book, published by Sir Thomas Dick Lauder, Bart. an interesting, faithful, and picturesque account is given of the *great floods* occasioned by the overflowing of the river Spey, and others, in the counties of Moray, Nairn, Banff, &c. in 1829, which, in their melancholy consequences, confirm the justness of the above poetical quotation, the author being well acquainted with the different localities which Sir Thomas so forcibly describes.

is, in many situations, of considerable extent), from this operation of the current on the edge of the banks, (as has been explained in section 1.), the surface of the whole fields, thus situated, is exposed to inundation, when the river is swollen by the rain, and the torrents which descend from the neighboring heights; often sweeping away the crop, and deteriorating the soil, by the lodging of sand and gravel at one place, and the carrying away the mould at another. A sudden and rapid flood has also the effect of changing the course of a river; making it abandon the old, and take a new channel, through part of the ground, perhaps more valuable, by its being better cultivated, and on that account more loose, and easily acted upon by the current. In this case, the loss is aggravated, by the old channel being left a useless waste, in addition to the space occupied by the new course which the water has taken.

Accounts of havoc, committed by such inundations, abound in all the county reports, and imperiously enforce the necessity of adopting measures to prevent them. From the following detail of the evils committed in one district, a judgment may be formed of the general loss sustained by the country at large:—"The haughs of Isla," says the surveyor of Perthshire, "from Ruthven bank to the mouth of that river, a distance of ten miles, are exposed to inundations which are great and destructive. In the glens lying north of the Stormont, floods do great havoc among the hay and other crops. In Athol, at Bun-rannoch, in Glendochart and Glenlochy, torrents from the mountains swell the rivers so suddenly, that they spread far and wide, in many places beyond their banks, and frequently sweep off almost the whole labors of the year. The Tay and the Earn, the Devon, the Allan, and almost every river within low banks, which takes its course through flat land, brings desolation on the finest fields, which lie on its sides."

In the northern counties of Scotland, inundations are not so frequent as in the southern. The reason is, that where a channel is rocky, which is the case with most of the highland rivers, it is generally deep, and the river seldom overflows its banks; but where the intersected strata is of a soft and gravelly kind, and the expanse of the flat or haugh-land of greater extent, as in the low country, the channel is invariably shallow, quickly filled, and soon overflowed.

The manner in which inundations proceed, deserves particular attention, because, from observing this, we will be the better able to discover the proper remedy. "When a river swells," says the learned Buffon, "its celerity uniformly increases, till it begins to overflow the banks. From that moment its rapidity is checked, which is the reason why inundations always continue several days; for, though the quantity of water should be diminished after the commencement of the inundation, it would, notwithsanding, continue to overflow; because this circumstance depends more on the celerity than the quantity of water. If it were otherwise, rivers would often overflow their banks for an hour or two, and then retire to their channels, which never does happen. An inundation, on the contrary, always lasts some days, supposing the rains have ceased; and less water runs in the river, because the overflowing of waters diminishes their celerity; and, consequently, although the same quantity of water arrives not in the same time as formerly, the effect is the same as if a larger quantity had been brought down."

Farther, it may be observed on the motion of water, that, mathematically speaking, if a river runs on a bottom having an equal descent, the velocity of the water will increase, the farther it runs. Thus, suppose the descent to be one foot per mile, after the first mile the water will have acquired a velocity of eight feet per second; after four miles, its velocity would be sixteen feet per second; and at the end of sixteen miles, it would run at the rate of thirty-two feet per second—its velocity at every point being the same proportionally, as would be acquired by a body falling the same perpendicular height. These rules, with regard to the motion of rivers, cannot however be so accurately observed, on account of the perpetual obstruction the water meets with against the sides and bottom of the channel it flows in, which counteracts the power of gravity, and reduces the water to an uniform motion, where the declivity of the bottom and sides are regular. Supposing a given quantity of water is to be carried off, the smaller the descent, the width and depth, or section of the river, must be the greater; for the water, running in a large body, and slower, meets with a less proportional obstruction from the sides and bottom. Also, supposing the same quan ity to be discharged, the larger the body it runs in, and the slower the motion, the more liable its course is to be obstructed by stones, mud, weeds, &c.

Large and deep rivers run *sufficiently* swift, and discharge vast quantities of water, with a descent of one foot per mile.

Small rivers and *large burns* require about two feet per mile. *Small burns* scarcely keep a free course under four feet per mile.

When a cut or channel, therefore, is to be made for a river or stream of water, through a tract of level ground, it is preferable to make it deeper at the lower extremity, in order to give a greater descent upon the bottom all the way, than to make a broad and less deep channel all the way upon a less descent; for the former method is attended with less expense of digging, and is better calculated to keep an open course.

From this explanation, it is obvious that the leading principle of all operations, to prevent a river from overflowing, should be *to increase and preserve its celerity.*

For this purpose, it may be first observed, that it is much better to deepen than to widen a channel. A contrary advice is given by some writers,* but, it is apprehended, without a sufficient attention to circumstances. If a river were always equally full, there can be no doubt that to widen its channel would prove a most effectual method to confine it within its banks. But as the quantity of water is constantly fluctuating, the widening of the channel would produce the following bad effects:—1. That when the stream happened to be small, it would scoop out a winding bed for itself in the middle of the channel; and upon swelling, would follow the direction of this bed, and thereby strike with violence against the banks. 2. That by lessening the depth of the river, its celerity would be diminished, and its liability to overflow of course increased; for it is an established fact,

* Beatson, Marshall, &c.

that celerity depends less upon the declivity of the channel than upon the weight of water. The importance of this objection is confirmed by this remarkable fact, that when once a river acquires a great celerity, it will both preserve it while running through a level country, and even surmount heights without spreading much to a side, or, at least, without producing any inundation of any moment.* 3. That by diminishing the celerity of the river, it would be more liable to be warped and impeded, as a greater quantity of *sulliage*† would thus be deposited in the channel.

At the same time, a caution must be given against carrying the principle here laid down to an extreme. It is as ineffectual to confine a river within too narrow bounds, as it is to give it too large an expanse. The width of the channel, therefore, should be such as will admit the water to flow freely, and maintain a *proper* or *safe* velocity.

To deepen the channel of a river, all the means which have been recommended for defending banks from encroachments—the removal of obstructions, and the erection of bulwarks to prevent the stream from spreading—will be found extremely conducive. In some instances, these operations may even preclude the necessity of embanking.

Where rivers flow through a very flat country, and their current is consequently less rapid, their overflowing, instead of being destructive, often produces beneficial effects, by depositing mud and other rich sediment, which tends to fertilize the soil in a very high degree. Where this is the case, embankment has a double advantage; for by means of sluices, a portion of the water can be admitted at the upper side, and retained at pleasure; by which means the influence of its effects can be regulated as circumstances require. Those large rivers that flow through valleys of wide expanse, have always a lengthened and crooked course, occasioned by the frequent changes that take place, by floods acting against the soil of which the low ground is composed. To make new and straight channels for such rivers, would be the most effectual improvement; but this, in many cases, would be attended with an expense much greater than the advantages to be gained. In others, however, it would be advisable to straighten such parts as are *very* crooked, and where the length of cutting would be short, and the expense moderate. By this means, the length of embankment would be shortened, and kept in a straight line, which is a great desideratum. Indeed, the line of embankment should be kept as straight as possible, even if the course of the river be crooked; for it is against the bends and turns that the water has greatest weight, and is most apt to burst through the bank. The loss of this ground, by its being excluded from culture, is counterbalanced by the security which it provides, in giving the water more room, and consequently lessening its force and pressure; and though not accessible to the plough, is valuable as meadow or pasture. The annexed plan, No. III. will further explain these positions.

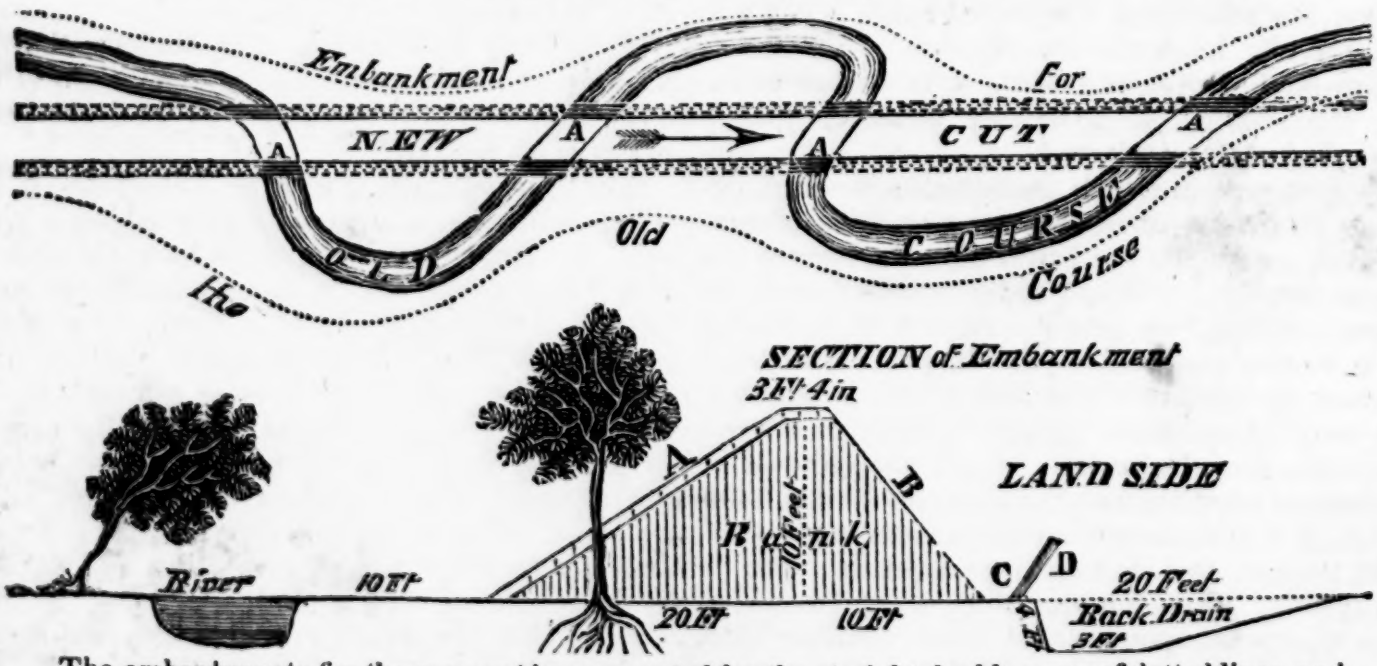
In all smaller streams, or *burns** (as they are called in Scotland), straightening, widening, and deepening the channel, is the first and greatest improvement; and, in many cases, these operations alone may be sufficient to confine the whole body of water in a flood, and so render any embankment or further defence unnecessary. If the capacity of the channel is not sufficiently enlarged by these means, the width between the embankments will require to be the greater, and their

* Buffon on rivers.
† Slimy, sandy, or other earthy deposit.

* *Brooks*, in England.

PLATE III. *Plan and Section representing a New Channel and Embankment for a River.*

The Points at A should be guarded by a facing of Stones or by Piles of Wood.



The embankments for the new cut is represented by the straight double rows of dotted lines, and should be 10 feet distant from the edge of the cut. The dimensions of the new cut should be 30 feet wide at top, 10 feet at bottom, and 6 feet deep, or in these proportions, according to the size of the stream.

Section.—A, Slope faced with turf. B, Sown with grass. C, Scarcement three feet broad. D, Paling.——Trees must be removed by the roots.

height, and breadth at the base, greater also in proportion. By examining the flood-marks, and measuring their height, that of the embankment may be ascertained; but it should always be raised from one to two feet higher than the greatest flood; for the materials of which it may be formed subside considerably after it has been constructed; and that according to their height. In general, it will be found that rivers which flow freely, and have no interruption in their course, even during the greatest floods, do not rise more than five or six feet above their ordinary level; so that, in most cases, a bank of six or seven feet in elevation will be perfectly adequate for every purpose of security.

The slope of an embankment should always be greater towards the river, than to the land side, in order to avoid that lateral pressure which is so destructive when the bank is formed too upright. The sloping of the bank is of great use in rendering it firm and secure; as it makes the resistance indirect, and of course lessens the pressure of the stream. On the north side of the Tay, between Errol and Invergowrie, there are some old embankments of stone, which rise nearly in a perpendicular line from the water. From being built in this injudicious manner, they have been found so insufficient, that it has been necessary to erect piers or juttees, to protect them from the violence of the current.

The base of an embankment should be *three* times the breadth of its height; and its width at top should be *one-third* of that height, as shown by the section of plate No. III. The line of embankment should be kept at a proper distance from the edge of the river bank, and the stuff of which it is formed should *all* be taken from the land side, to prevent breaking and loosening the surface on that next the river, which would expose it to encroachment from the current. If there are any heights in the field adjoining, within a short distance, the earth may be partly taken from these. and from the cut that may be necessary at the back of the embankment, for receiving the surface-water from the fields. The earth from this cut should be removed with a gradual slope backwards, so as to give an easy descent from the surface to the bottom of the drain. All trees and brushwood should be removed from the space betwixt the embankment and the stream, to give no interruption to the current, or throw the force of the water against the mound. Any tree or bush, in the line of the bank, should be removed by the root; otherwise, it may shake and keep the mound loose at that place, and give admission to the water. A wooden frame of the exact shape and size of the bank should be made, that the workmen may execute it with accuracy; for it is of consequence to have the mound formed regularly, and as even and smooth as possible, that the water may meet with no obstruction, nor take hold of any inequality on the surface of the side next it. In constructing the bank, the earth should be well tramped, and beaten down with heavy mallets, and that part of it of the firmest consistence should be used on the side next the river. That side should also be faced with well swarded turf, as soon as the slope is finished. It may be necessary to pin down the lowermost layers of turf, and to water them (if a dry season), that they may adhere the more firmly, and prevent the grass from decay. The side next the field may be sown with grass seeds, which may also be sown upon the other side, to close the interstices between the turfs, and to thicken the sward.

In executing an embankment, it should always be begun at the upper end, and proceeded with downwards; finishing, if possible, the portion of work for the day, in case of any sudden swell of the river injuring it, if left irregular and not completed. It is not necessary to found the bank any lower than the adjoining surface; the turf only may be taken off, which will be useful in covering the slope, and the earth will unite more readily than it would do otherwise. A *scarcement*, or unbroken space, of two or three feet must be left between the edge of the embankment and the trench that is cut along the back of it. A paling should be erected along the inner side of the scarcement, to prevent cattle from going up, trampling upon, and breaking down the bank, till it be fully consolidated, and swarded with grass.

Embankments are usually executed by contract, and may cost from fourpence to sixpence the cubic yard. The contractor, for the sake of greater security in the execution of the work, should be bound to uphold them for the first two years.

All the water that may collect in the fields adjoining, should only have *one* outlet through the embankment to the river, at the *lowest* point, and that by a pipe or square box of wood, with a valve or lid, fixed to the mouth of it by hinges on the upper side. The valve will shut in floods, to exclude the river, and the pressure of the land water will open it when the flood subsides.

It is improper to sow or plant any tree, hedge, or shrub, that takes deep root, or grows to any height, on the sides or top of the embankment; for by these, the earth would be loosened, the water admitted, and the mound shaken and carried away. If the seeds of rushes, flags, tussilago, or fiorin grass, be sown, these will bind the surface, and prevent the water from making any impression upon it.

Holes made by moles or mice are also dangerous, on account of their admitting the water into the bank, and should therefore be immediately closed up. Lastly, when the smallest breach appears, it should be instantly remedied; for if the water once takes hold of a broken space, it is sometimes difficult to stop its progress. For these purposes, it is necessary to make a frequent inspection, where works of this kind are on an extensive scale.

On the river Spey in Badenoch, the meadows on the estates of Belville and Inverishie,* that were formerly overflowed and inundated by every flood, are now embanked in the most complete and secure manner, according to the description that has just been given; whereby above a thousand acres of land are now rendered safe and productive. On the Gordon and Findlater estates, much might be done in the same way. On the rivers Beauly, Carron, Clyde, Dee, Don, Earn, Esk, Forth, Isla, Ken, Nith, Tay, Tiviot, Tweed, &c. a great deal of land has been also embanked in an effectual manner; and on these, as well as many other rivers in Scotland, the extent of land that

* The latter, according to a plan and specification by the author; as also, others of considerable magnitude on the rivers Dee, Don, Eden, Ken, &c.

might be preserved and improved by this means, would amount to many thousand acres.

PART III.

ON THE EMBANKMENT OF LAKES.

All lakes are subject to temporary, and sometimes to extraordinary, swells, occasioned by great falls of rain and snow descending from the mountains that surround them; consequently, they often spread beyond their usual limits, overflowing and injuring the contiguous grounds. The damage they do in these cases is not attended with such devastation as the overflowing of rivers, whose current carries every thing before it, for as the water of lakes subsides gradually, it acts with less violence, and commits less injury. The consequences, however, are always so hurtful, as to make it an object of considerable importance to prevent or lessen them, by confining the water within proper limits.

Lakes that are surrounded with mountains, such as those in the northern parts of Scotland and of England, are known to have increased considerably in height; but in the same time their depth has diminished. This is occasioned by the rapid streams from the hills that run into them, bringing down sand, gravel, and other loose matter, which being deposited in the bottom of the lake, raises its bed, and tends also to choke the outlet, and to retard the discharge. This has also the bad effect of raising the channel, and obstructing the current of such streams as flow *into* them through level ground, and causing these streams likewise to overflow the land adjoining. This is the case with many large lakes, that have stretched beyond their original bounds, particularly that of Loch Lomond, where a small island called Camstradden, which existed in the time of Camden, is now covered with water to the depth of two or three fathoms. At the upper end of the same lake, there is at present a large extent of flooded meadow, that formerly must have been a part of the lake, of no inconsiderable depth.

As lakes subside greatly in the summer season, and swell much in winter, or after heavy falls of rain and snow, it would be desirable to confine them to their lowest limits; and to cut off such creeks and bays where the water is seldom of great depth, and where an acquisition of pasture or meadow ground might be gained. In some lakes, indeed, the extent of surface overflown in winter, so much exceeds what the water covers in summer, that it would be a very desirable object to confine such lakes to their smallest extent. The first thing, then, to be attempted is to enlarge the outlet, that the water may at all times have a free and easy discharge. It would be advisable to deepen this, if the level admits; but in all cases, it will be proper to widen and enlarge it, as much as the expanse of the lake, and the body of water it contains, may require. If rock, this may be difficult and expensive; but may be compensated by the advantages to be acquired, and the certainty of its always remaining open and entire.

The form and construction of the embankment that is to surround the lake, may be similar to that for the sides of rivers, as already described; but as the water, in the former case, presses more directly upon the bank, the slope next it should be greater on that account. The exact degree of slope will depend upon the stillness, or agitation, which the waters of the lake are known to exhibit. In those subject to high waves, from their extent, situation, and exposure to winds, the slope will require to be *twice* as much as that which is necessary for river embankments, where the water presses only in a lateral direction, and where the current glides gently. The embankment should not be confined to the verge of the lake only, but should extend along the sides, both of the stream that flows into it, and that by which it is discharged, as far as the level requires; or must be carried to the higher ground on both sides, above reach of the flood, as shown by the dotted lines marked *bank* in the plan. There must be a back trench or drain to intercept the land-water, and discharge it at the lowest point; and also one, under the high ground, for the same purpose, as represented in the annexed Plate, No. IV.

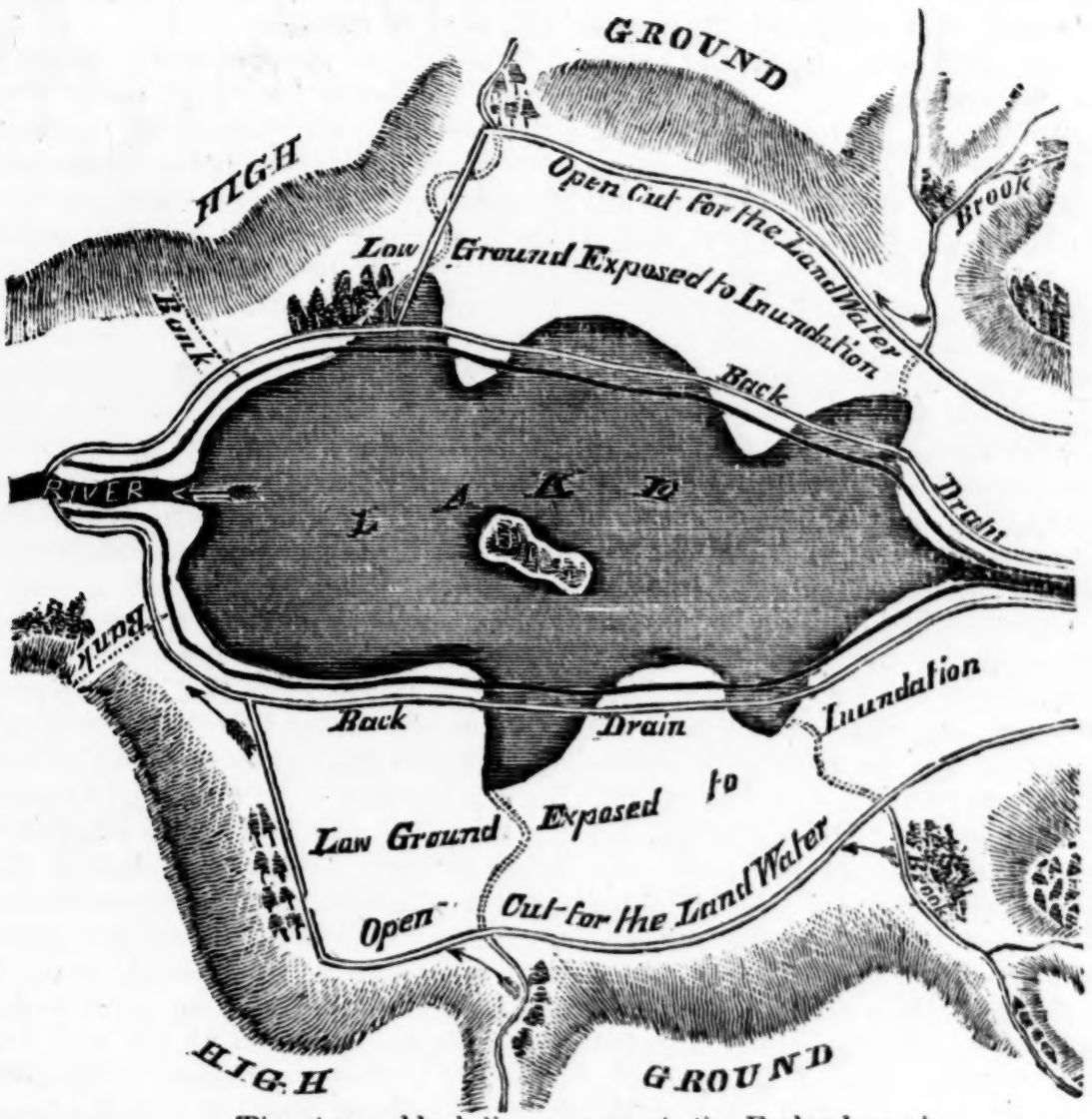
It may be proper to observe, that where a lake is encompassed on all sides by the lands of one proprietor, he may perform such operations upon it as he thinks expedient; but, if the adjacent lands are the property of several individuals, and they have also a mutual share of the lake, every operation on it must be regulated by an attention to their respective interests. Or, if the lake is situated at the head of the river or brook, it may be considered the source of the stream, and no alteration can be made upon it, which may in any degree prove injurious to the proprietors below. It may, however, be remarked, that it is only by such alterations upon the area of the lake, by which an undue portion of water may be taken from, or thrown upon an opposite proprietor, or the general supply of the stream diminished, that a legal cause of complaint can arise; for it is the right of every proprietor to defend and improve his own land, provided it is not done with the evident intention of injuring his neighbors.

PART IV.

ON THE CONSTRUCTION OF WEARS AND DAMS ACROSS RIVERS, FOR THE USE OF MILLS; AND ON THE FORMATION OF BANKS OR HEADS, FOR ARTIFICIAL PONDS AND PIECES OF WATER, &C.

This is a branch of the subject which requires considerable attention; for there is no species of embankment or fence, upon which more money is expended, or where more failures take place. Dams or wears across rivers, for the purpose of raising the water to such a level that it may be conveyed in a lead for the use of mills, &c. are often expensively executed at first; and, for want of being properly constructed, are in constant need of repair, and are sometimes swept away altogether in time of floods. It has hitherto been the custom to erect them in a straight or oblique line across the stream, and to construct the dike in a triangular form, wide at the base, and coming gradually narrower towards the top, where it ends in a point, as represented by Fig I. in Plate No. V. A dike of this form and structure must be very insufficient, and liable to be disarranged and thrown down by the force of running water pressing upon and falling over it. The upper stones

PLATE IV. *Embankment of a Lake.*



The strong black line represents the Embankment.

PLATE V. *Plan and Sections of Wear and Head for Artificial water.*

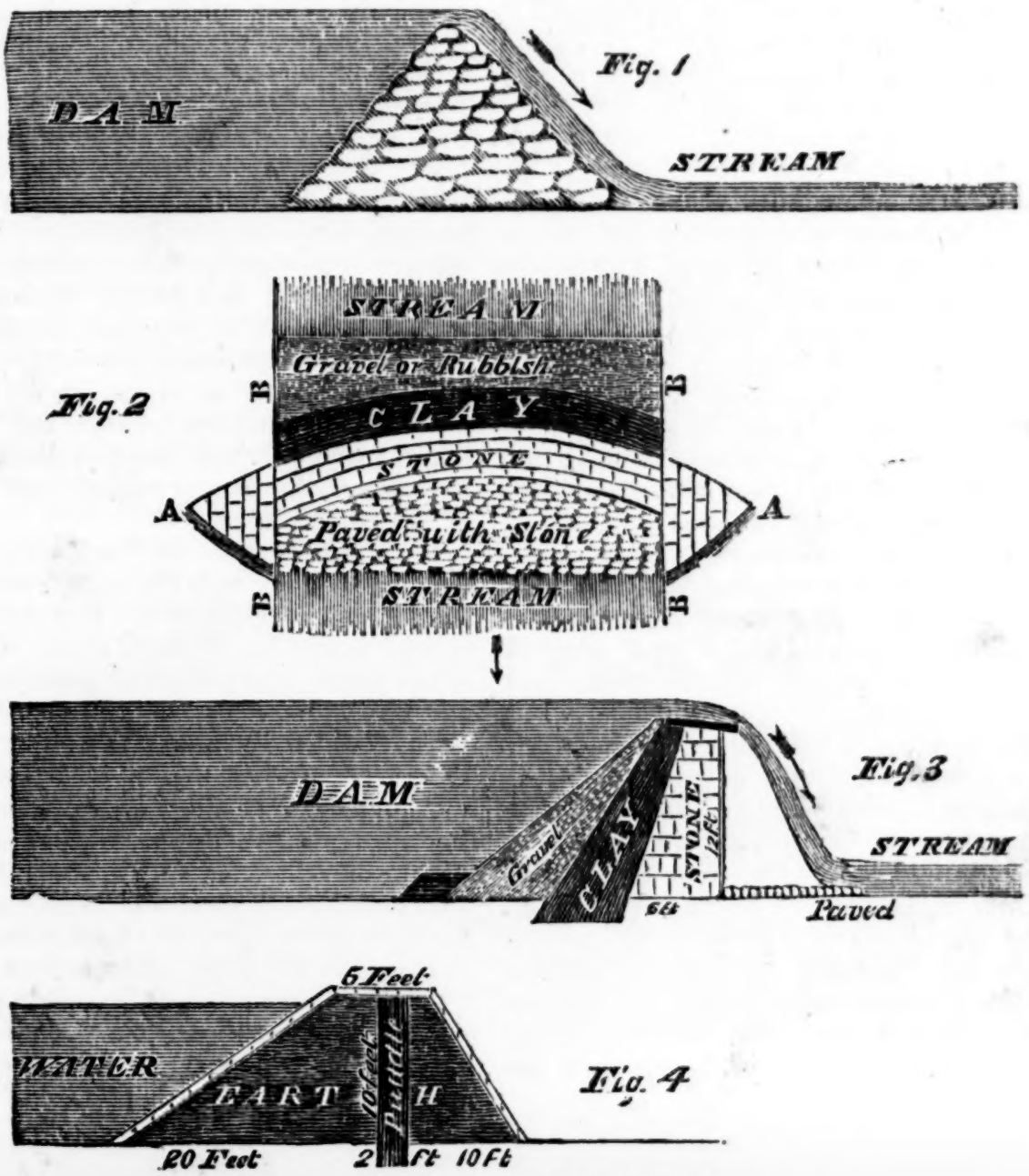


Fig. 2.—A A, Abutment of stone. B B B B, Bank of the .

are first loosened and carried down, and the water striking with velocity on the whole face of the dike, precipitates itself with violence against those at the bottom, and displacing them, the whole structure is soon demolished.

Dams, that are erected at a still greater expense, of hewn stone, but of a similar construction, are also liable to be destroyed (although in a lesser degree), if the lower side is formed with a slope, or inclined plane. The water, in this case, does not insinuate itself in such a body among the stones that are joined, as it does when they are loosely laid together, as in the first mentioned case; but still, the force of the falling water has such effect upon the undermost layers of stone, that in time it cannot fail to undermine and displace them. The first error in all these kinds of stone-wears, is the carrying them in a *straight line* across the river or stream. They should be constructed so as to form an arch across the bed of the stream, with the convex side upwards, the ends resting on strong abutments placed in the bank on both sides. By this means the force of any body of water, however great, will be effectually resisted, and the structure be perfectly firm and secure. The greater the slope towards the upper side, the better, but the lower side should be nearly perpendicular, that the water may fall over it like a cascade, without coming in contact with the face of the building. Figs. 2 and 3, of Plate V. are a plan and section of this. Dam-dikes, of the construction first mentioned, are sometimes secured by beams of wood, forming a kind of frame-work, in which the stones are placed, But this is liable to accidents, by the wood rotting and giving way; consequently the stones lose their hold, and are soon separated and displaced.

In building the dike or wall, as represented by Fig. 3 in the Plate, it is necessary to dig till a firm foundation be found. The height will be regulated as circumstances direct, and the breadth of the foundation must be according to that height. If the height be twelve feet, the breadth at the foundation may be six, and at top, two feet. The stones should be bedded with as much care as possible, and the joints closely cemented with mortar or *tarras*, that no water may escape, and that the building may be firm and durable. When the wall reaches the requisite height, it should be exactly level across the whole length of the stream, that the water may spread over the whole, of an equal thickness, and so moderate its force in time of a flood; and upon the top, there should be a coping of flat stones, neatly cut and jointed, projecting nearly a foot over the perpendicular wall on the under side, with a rise of a few inches towards the upper side. The length of these stones will require to be three feet; but, if such are difficult to be got, planks of oak, or larch wood, may be used in their stead. That no water may leak through the building, it will be proper to have a bed of clay, three or four feet in thickness, along the upper side of it, well beaten down, and that to the whole height of the wall. The section of clay should be founded lower than the breastwork of stone, to prevent the water escaping under it. The coping stones should be laid on clay or tarras, so that the upper part of the building may be perfectly water-tight, which is a material object in operations of this kind. Gravel, or any loose rubbish, should be tumbled over into the dam, above the clay, shelving gradually from the dike into the water, so as to make the slope as long and easy as possible.

The use of the projection in the coping is to throw the water clear over, so as it may fall at a distance from the bottom of the building. The pavement there will prevent the water making an impression, or opening a cavity in the bed of the river, whereby the wall might be undermined; and it is necessary that this pavement should extend so far as to be beyond reach of the fall when the stream is in flood.

Heads, or *banks of earth*, for the confinement of water in artificial lakes or ponds, are often constructed at great expense, and not being properly formed, often break out, and occasion considerable damage. The error in their construction is commonly owing to the want of breadth at the base, in proportion to their height; and to their not having a sufficient slope towards the water, nor a proper section of *puddle* in the centre.

Fig. 4, in the Plate No. V. is a representation of what an embankment of this kind should be, according to the supposed depth of water it may have to support. As this bank is acted upon by the water, in a similar manner as that for the confining of lakes, as has been already described, its degrees of slope should be the same, more or less, according to the depth or shallowness of the water. If in a park, or pleasure-ground, the outward slope should also be greater than that of any other embankment, that it may connect more naturally with the adjoining surface, and have as little appearance of art as possible; and shrubs, or clumps of low trees, may be planted on it, to lessen that appearance. Mounds for this purpose are commonly constructed across dens or hollows, where that part of the water immediately above them is of considerable depth. Where this is the case, and the depth exceeds ten feet, the breadth at the base of the embankment will require to be greater in proportion than the section represented in the plate; that is, if the depth is fifteen feet (which it will seldom exceed), the breadth at bottom should be sixty feet; and at top, fifteen. The puddle will require to be equally thick in proportion, and must be sunk several feet deeper than the surface on which the bank is founded, or till a stratum of clay or other safe foundation is got. The mound should be formed of as solid materials as can be got from the space to be occupied by the water; and to render it the more compact, it should be well beaten down, and consolidated in the course of its being formed.

Both sides should be lined with turf, and the water should not be admitted for some months after the bank is completed. For want of attending to this, many heads have given way, by letting in the water, and filling the pond, before the earth was sufficiently consolidated; and it is very difficult to make up a breach in the bank afterwards. Where the artificial mound joins the natural banks, a space should be dug out, to insert, as it were the one into the other, to prevent the constant pressure and agitation of the water at these points from making a breach, and forcing an outlet there. A sluice, strongly secured by mason-work, should be placed in the most convenient part of the bank, to let out the water when necessary; and an overfall, for the waste water, will also be requisite, which ought to be particularly attended to. This

should be placed in the solid, or natural bank, at either side, as situation and other circumstances direct, and must be strongly paved with stone, founded on clay; or it may be formed by a sloping tunnel of stone and lime, through the bank, if it rises to a considerable height. This last may, in many cases, be the most advisable, although it is a plan seldom adopted. Sometimes the fall, or outlet for the waste water is constructed of wood; but this is liable to many objections; such as, its alternate exposure to wet and dry, by which means it becomes *warped*, and its joints burst asunder; and its being subject to quick decay, and apt to be undermined and lifted up by a sudden swell of water. If the head is to be erected across a considerable stream, to be widened and formed so as to contain a greater body of water, that it may have the appearance of a river or lake, it may be constructed according to fig 2. in the plate.

In these last embankments of earth (for lakes and artificial ponds), it is particularly necessary to attend to any holes or openings that may be made by moles or mice; for where the water is always pressing against the bank, and ready to ooze out through the smallest aperture, any outlet of that kind should be immediately closed up. A thin coating of hard gravel, immediately below the turf, well beaten down, would tend effectually to prevent the working of vermin of that kind.

CONCLUSION.

In arranging the subject of this 'Treatise on Embankments, &c.' into its proper *heads* and *sections*, that order has been followed which naturally presented itself, according to the degrees of importance which the different branches seem to merit.

Embankments from the sea, are no doubt the first in point of importance, and have a strong claim to the consideration and attention of those active, public-spirited, and wealthy proprietors, whose estates lie continguous to the coast. Where a great stretch of the shore, capable of being recovered from the sea, bounds the property of various individuals, the undertaking should be a joint concern; for, in many cases, it would be easier, and more effectually accomplished in that way, than in separate and detached portions. The expense, too, would be infinitely less, by saving the cross banks that would otherwise be necessary, were only part of a bay of the sea to be embanked at one time.

The ideas of some ingenious and enterprising projectors upon this subject have surmounted the bounds of common understanding so far, as, by their speculations, to have deterred those from entering seriously upon undertakings of this nature, who otherwise might have been willing to execute such plans, on a more moderate and less expensive scale. Persons of this speculative turn of mind, however, are useful in society, so far as they are the means of setting others to think of enterprises that some time or other may be carried into effect. Many great works have, in time, been executed, that were originally suggested by projectors of this description, whose speculations were then looked upon as the mere chimera of a distempered imagination, and absolutely beyond the power of human exertion to accomplish.

England has already shown the practicabilty of these improvements in the art of embanking, in all its various degrees; and it is hoped, that this part of the kingdom will profit by her example.

The second branch of this subject is less open to these objections. That the *improving the channels of rivers, and embanking the land liable to be injured by their overflowing*, is an operation of more practicability, must be generally acknowledged. The benefits to be derived from it are equally certain, and are more easily attainable.

That of lakes, of the nature and description that has been given, has likewise its claim to attention. There are many in Scotland, where a great addition of useful land might be acquired, and that in parts of the country where an acquisition of this kind would be doubly prized. Such would the case in those highland districts, where low-lying ground is of the greatest value, for the purposes of culture and the produce of hay for the winter maintenance of stock.

Lastly, the works that are erected, both for use and for pleasure, in the *construction of dam-dikes and formation of artificial ponds of water*, are often faulty in the design, and expensive in the execution. The rules and directions for these have been suggested from observation in different parts of the kingdom, where the writer has had the opportunity of viewing and examining them, as well as from his own experience in planning and directing works of the same kind. *Of sea-dikes and river embankments*, he has also, in the course of his profession, had the designing and direction. He has, therefore, with some degree of confidence, treated that part of the subject; and can safely recommend to the notice of those who may be desirous of undertaking such works, the various modes of execution that have been explained. At the same time, in submitting these observations to the public, he deems it proper to add, that they are, in a great measure, corroborated by the opinion of others who have written *partly* on the same subject, and whose communications he has consulted. He has avoided entering into a lengthened detail; but has endeavored to explain the whole system of embankment, in as concise and perspicuous a manner as the nature of the subject would admit.

If this short treatise, therefore, shall be the means of promoting the knowledge, and extending the practice of these useful undertakings, he will feel the satisfaction of having, in some degree, contributed to that effect.

APPENDIX.

HINTS AND DIRECTIONS FOR THE CULTURE AND IMPROVEMENT OF BOGS, MOSSES, MOORS, AND OTHER UNPRODUCTIVE GROUND, AFTER BEING DRAINED.

It has been wisely remarked by the late excellent Bishop of Llandaff, in his 'Preliminary remarks to the Agricultural Report of Westmoreland,' that "the *waste* lands of the kingdom are a *public* treasure in the hands of *private* individuals."

It is from waste lands, not hitherto *completely cultivated*, that the greatest profit can be made (when once brought into culture), rather than from land which has been long under the plough; not merely from the rent of such land being comparatively low, but, from all *new land, when improved*, yielding, when properly managed, more

profitable returns, than can be obtained from those soils that have been long under cultivation. No object in nature can appear more unpropitious, than an *undrained, uninclosed*, waste tract of ground, overrun with heath, rushes, and other useless plants, producing the most stinted herbage, and giving an appearance of sterility, even to the cultivated parts that may adjoin or surround it. Notwithstanding these unfavorable appearances, however, such land is, in a greater or lesser degree, according to situation and climate, capable of improvement; and, *when improved*, rewards the cultivator in a tenfold degree.

The next thing to be considered, after a bog, moss, or other kind of marshy ground, has been *completely* drained, is, the means most easily accomplished, and best adapted for its further improvement.

If such ground is overrun with rushes and other coarse aquatics (which is almost always the case), nothing will tend more to the *first part* of its improvement, than *over-stocking* it with cattle, so soon as it acquires a sufficient degree of solidity to bear them with safety. But care must be taken not to put them on it till it be *sufficiently* firm; otherwise the surface will be poached, and the coarse herbage not closely eaten down. By this means, the strength of the *rank* grasses will be nearly exhausted, and the roots will decay for want of their *accustomed* moisture. The trampling and pressure of the cattle will also help to consolidate the surface. By this first process alone, a wonderful change soon takes place; all the aquatics soon decline, and give way to better grasses, which spring up in abundance.

Lime or marl, spread on the surface, will greatly increase the growth of white clover, and other kinds of fine natural herbage, after the rushes and coarse plants have been closely cut, and eaten down by the cattle.* The first thing, however, to be done, whether the field is to remain in the natural state of pasture, or to be cultivated by tillage, is to level the surface; the natural irregularity of which is, in most cases, an obstruction that ought first to be removed. The earth that composes the highest parts should be removed, and mixed into a compound with lime, to be used either as a manure for a crop, or spread on the surface as a *top-dressing* for grass. Earth of inferior quality may be substituted for filling up the deepest hollows. Where the nature and situation answers, no improvement is so cheap, so sure, or so profitable, as converting a certain class of bogs into water-meadow.†

If it lies along the side of a river or stream, of which, by means of proper dams, trenches and sluices, a command can be obtained; and if the process of irrigation is managed with skill and attention, it never fails to produce luxuriant crops of grass. This crop is in every respect best adapted to the nature of such ground, being less affected by the inclemency of a cold or moist climate, and giving a more sure return, without the labor and expense of annual culture, than any crop of grain that might be produced. As a proof of this, the water-meadows on the estate of Odstone-Hall, in Leicestershire (already alluded to), from being mere bogs, before they were drained by Mr. Elkington, now produce as abundant crops of grass as any of the kind in that part of the kingdom. As a further instance of the good effects produced by watering this kind of land, Mr. Boswell, in his treatise on that subject, says:—"Lands that are very boggy, require more and longer watering than any sandy or gravelly soil. The larger the body of water that can be brought upon them the better: its weight and strength will greatly assist in compressing the soil, and destroying the roots of the weeds that grow upon it; neither can the water be kept too long upon it, particularly in the winter season, immediately after the *after-meat*† is eaten; *and the closer it is fed the better.* This species of soil, after being *well drained* and watered, will equal the wishes of the most sanguine, by its improvement."

No general system of irrigation can be properly laid down, applicable to every particular case, farther than some general directions, that hold good in every situation: but, in other parts of the process, different modes must be adopted, according as the situation and form of surface require In those where the command of a river or stream can be obtained, the general rule is, to collect a sufficient quantity of water, nearly on a level, in a main carrier, which can, by means of sluices, constructed at proper places in the sides of it, be let out into floating trenches, cut along the surface of the field, or sides of the declivity, one below another. These floating trenches will collect the water from above, after passing over the spaces of ground betwixt each, and distribute it equally over the surface of each space lying between them, alternately. Proper attention must be paid, at the proper seasons, to open and close the sluices, in regular rotation, so as to flood different portions of the land successively; and the floating gutters should frequently be cleaned and scoured out, to prevent their choking up, and to destroy the growth of rushes, or other grass that may grow up in them. From the very absorbent quality of the peat, the water would require to have a more rapid motion on bogs, than on soils less porous or spongy. The saving of manure is another circumstance in favor of water-meadows, as the application of it would appear to be of no material consequence, being very seldom used by some of the best flooders in England.* Still, however,

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* The best time to cut rushes, &c. is when the shoots are weak, and before the seed comes to maturity. If left till the seed is ripe, it is shaken out, and, falling on the ground, multiplies their growth. They should be *frequently* cut before this season, which will soon extirpate them.

† It must be understood, that the surface of the bog has been properly levelled, well rolled, and a good sward of grass on it, before the operation of floating can be attempted. It is a fact well ascertained, that in Merionethshire there is land that was formerly not worth 6*d*. per acre; but being now *drained and flooded*, besides affording excellent pasture till the 1st of June, produces two tons of good hay, cut in the beginning of August.—*Agricultural Report of Merionethshire.*

† Or *latter-math*, as it is commonly called; that is, the pasture or after-grass, when the hay has been cut.

* The late celebrated Bakewell, who was a great advocate for watering, used no manure on his water-meadows. It was a favorite idea of his, that water made to float over the greatest bog or swamp, *without being drained*, would not only have the effect of producing a finer herbage on it, but that the pressure of water artificially brought upon it, would force back that with which it was already overcharged, into the

lime or shell-marl dissolved in the water of the upper carrier, would be attended with the most beneficial effects. Its finer particles would thus be intimately diffused over the surface, would be lodged in closer contact with the roots of the grass, and afford them additional nourishment to what they receive from the fertilizing qualities of the water. The operation would be simple, and the expense trifling, from the small quantity of lime sufficient for the purpose. The lime should be laid down along the side of the uppermost trench or carrier, and, after being *slacked*, put, in small quantities, among the water in the cut, and, being stirred about, would be carried down by the stream, and equally diffused over the surface. It is to be observed, that the lime, or shell-marl, is only to be used in this manner, the last days of the watering for that season. The refuse of salt, used in this manner, would be a valuable improvement; its fertilizing qualities being equally beneficial on pasture, as well as on arable land.* These experiments the author has not seen practised, though he here recommends them; but it is obvious to every one who is in the least acquainted with the object of flooding, and with the qualities of these manures, that it must prove beneficial, beyond a doubt.†

As it is only in certain situations where this mode of improvement, by means of water, can be adopted and practised with advantage, it is necessary to take notice of the other means that may be used, and that are best calculated for the improvement of bogs, by converting them into a state of cultivation so soon after draining as they become accessible to the spade or the plough.

If the bog is of considerable extent, the first thing to be done after draining, or which may be done at the same time, is dividing it into proper inclosures, by open ditches.

These will assist in carrying off the surface-water, which the covered drains do not effect; and part of the earth thrown out of them may be mixed in a compound with dung and lime, or made use of in filling up some adjacent hollows. If the ground is to be pared and burnt, part of it may be burned along with the turf; but this is supposing that no thorns or quick-fence is planted along the ditches; in which case, no bank of earth is requisite on either side. In ploughing, regard must be paid to the proper direction and inclination of the ridges and furrows towards the open ditches, in order to discharge the rain-water as it falls. The great object is, to get the ground brought into such a state as to be fit for being laid down with grass-seeds, after which it may be considered in such a state of improvement, that any subsequent crops will require no more than ordinary management to cultivate. Some bogs, when *too much drained*, are apt to become parched in dry seasons. To remedy this, if the ground is very flat, or nearly level, sluices may be placed in the lower end of the division-ditches, which, in very dry seasons, may be kept shut, to *retain* the water received from the top-drains. If the ditches have a descent, so that the water cannot stand level all the way, several sluices of this kind will be necessary; or the water may be stopped, by building in turfs. The water may be allowed to stand within a foot, or a foot and a half, of the surface, and, by its stagnation, will ooze through the peat, or upper soil, and afford such a degree of moisture as will greatly relieve the crop. If in pasture, the cattle should not be allowed to feed on it while the water remains in the ditches, nor for some days after, as they would *poach* the surface too much, and the heat would induce them to go into the ditches, from which they might not easily get out.

In levelling or smoothing the surface, it will be necessary to use the spade, by which the work will be done nearly as expeditiously, and much more effectually, than with the plough at first. There are various opinions, how far paring and burning is conducive to the improvement of land. Some have condemned it, as a practice that ought to be exploded *on every soil;* yet, on a certain class of boggy ground, it may be considered as a very great improvement, not only from the excellent manure that the ashes produce, but also from its destroying the roots of every noxious plant more effectually than could be done by means of fallowing alone. The ashes of the burnt turf,

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channel from which it sprung. That nothing can be more absurd, the following fact will prove:—At Drayton-park, near Tamworth, in Staffordshire, a considerable extent of bog was thus watered, by a cut for that purpose, conducted under the direction of Mr. Bakewell, at a very great expense, and which, after being completed, had the effect of rendering the ground much worse, and more swampy than before. This, to the surprise of Mr. Bakewell (but not entirely to his conviction), not having the effect which he argued it would, Mr. Elkington was applied to, who, by means of a drain which he made, and which did not exceed *one-third* of the expense of Mr. Bakewell's waterworks, has rendered the ground worth *ten times* its former value, and it now produces crops of grain equal in value to any that is produced in that country. This is mentioned, as a proof that land of that description, without being previously drained, can never be watered with advantage.

* In a communication to the Board of Agriculture, on the nature and qualities of salt, as a manure, by Mr. Roalfe, of Sandwich, he says—"Salt is also excellent upon rushy and sour pastures, which are subject to occasion the rot in sheep: such is its effect, that it prevents that destructive evil from attacking them."

† A method nearly similar to this, seems to be practised in watering ground in Switzerland, as appears from the following remark in a treatise, entitled, "Le Socrate Rustique," 1764:—"Our cultivator considerably augments the vegetative properties of the water by *rich mould*, procured, as I have already mentioned, from green turf, cut from eminences in pasture, or from fallow land. This he throws into the principal head of water, so that the lesser channels may imbibe and communicate fertility over the meadow." In a note by the translator, alluding to this passage, he says—"This is a good thought; but the benefit on some soils, of casting *slacked lime* into the stream, would be much greater, and acquired at a much less expense."

Another method, practised by Mr. Miller of Dunstall, in Staffordshire, merits attention. On the stream which he applies to the floating of his ground, are two ponds, for the purpose of supplying mills situated below. From these ponds the floating trenches are supplied; and as there is always a quantity of fine mud deposited in the bottom of them, this he stirs about, so as to be carried along with the water, and equally distributed over the surface. The success of this practice warrants its recommendation.

Although the watering of land is now arrived at a very great degree of perfection, yet these hints seem to have escaped the attention of most practical flooders.

when mixed with the soil by a superficial ploughing, so enrich it, as to produce excellent crops, for two years at least, and if a litttle lime is added, it will help sooner to pulverize and stimulate the soil. If the bog is covered with long heath, or ling, and other coarse *benty grass*, it might be proper to burn it *growing*, without paring off any part of the soil. But this would yield only a small quantity of ashes; neither would it destroy entirely the roots of the plants, and, when ploughed in, would produce very little effect. So soon as the turfs are reduced to ashes,* they should be equally spread over the svrface, ploughed in with a light furrow, and turnip or potatoes ought to be the first crop. If the former, they should be sown *broad-cast*, and fed off with sheep. By this the soil will receive great benefit from the dung and urine, and from the refuse of the plants, and by its being consolidated by the trampling of the sheep. It will then be in good state for a crop of oats or barley, which should be sown with grass-seeds, well rolled down. The ploughing, after the turnips are eaten off, should be very slight, not to bury the sheep's dung, &c. too deep; in which case, a crop of oats is preferable to barley, as the preparation of the ground requires less ploughing. If the soil is full of the roots of rushes, and other weeds, a course of summer fallow will be requisite, before any crop is taken; and if the ashes have been made in one corner of the field, they can be spread over the surface, before the seed-furrow is given; and the roots and tough clods may be collected into heaps, burnt, and spread along with them.

If the bog is deep of peat, and very soft, so as not to be fit to bear horses in the act of ploughing it the first year, a crop of *turnip broad-cast* may be got, by sowing the seed among the spread ashes, harrowing it in with a light harrow and roller, drawn by men. The turnip should be eaten off with sheep, and the ground will next year be so much consolidated, as to admit the plough.

If the surface is not pared and burnt at all, a course of fallow, even for two years, will be necessary, to reduce the soil to a proper mould; in the last stage of which, the lime, or other manure, may be applied. In this case, two white crops, with an intervening one of turnip, potatoes &c. may be taken, before the grass-seeds are sown.†

All boggy soil whatever, after being once broken up, and pulverized by tillage and a course of summer fallow, should not be overcropped before being laid down in grass; and when once brought into a good *sward* of grass, should not be too soon broken up, but continue so, brush-harrowing and top-dressing it, when the herbage begins to fog. Frequent rolling is also very necessary on such soft soils.

It is better to feed sheep the first and second years on the grass, than to cut it for hay, as it causes the roots of the plants to strike more horizontally through the soil, and more closely cover the surface. For this purpose, a greater proportion of white and yellow clover, and other short *grass*-seeds, should be sown. In the second breaking up of the ground, after lying some years in pasture, no particular mode of practice, or rotation of cropping, can be laid down. The state of the ground, then, must be the rule for after-management, by which time it will not only have attained a firmer texture, but also a degree of strength to produce any crops, with proper manure and cultivation. In manuring soft boggy soils, one precaution is necessary. The deeper the ploughings are, previous to the dung being laid on, the better; but the subsequent furrows should be very superficial, and the dung intimately mixed; for when it is ploughed in too deep, not equally distributed and incorporated with the soil, it is apt to subside below reach of the plough, or horizontal roots of the grain. The same is the case with lime, which always penetrates deeper into the soil; and marl, when buried too deep, loses all its effect.*

Upon soft boggy land, intended only for pasture, nothing will work a more quick improvement than covering it with a thin stratum of clay, gravel, or any other earth heavier than that of which the bog is composed. Clay-marl, where it can be got, is of all others to be preferred, both on account of its greater weight, and enriching qualities. Sea-sand, being mixed with shells, is peculiarly adapted for this purpose, if the bog is situated near the sea, where such can be easily got. The weight and pressure of these heavier bodies makes the bog soon become more solid, and likewise presses

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* In burning the turfs, after they are properly dried, they should be set up in *large heaps*, adding to them as they burn. This confines the smoke and flame, by which so much of the essence is evaporated and lost, when the turfs are burnt in small heaps.

Paring and burning the turf, is, in some places, begun in the month of March; but it is better to delay the burning till April or May. The paring, however, may be done in March, and the turfs will be dry enough for burning in the month following.

† Rye, being a hardy grain, and thriving on very poor soils, is a very profitable crop on *drained boggy land, pared and burnt*, as appears from the following extract of a communication to the Board of Agriculture, respecting the state of husbandry in the neighborhood of Petersburgh: "Rye-bread, as every body knows, is the chief support of this district, as well as of the other northern parts of Russia; but, in order to save the rye-flour, and to make it last the longer, the inhabitants, when compelled by necessity, mix with it *fine-ground oatmeal*, the meal of buckwheat, and the husks of the field mustard seed *(sinapis arvensis)*. The produce of rye in very few places varies more than here. The poor sandy lands will hardly produce more than three times the quantity sown. The middling sorts of land produce four and six times the seed. The rich and well manured lands, and such where wood has been cleared off, will produce, in a good season, ten or twelve for one sown; but the most extraordinary produce is gathered from *boggy lands, drained*, and sown with rye; as in a favorable season it increases forty times and upwards. The reason of this extraordinary increase must be explained: it is owing to the ashes produced *by burning the bogs*, which assist the vegetation to that degree, that frequently they find one grain produce forty plants, and even more; for this reason, they generally use a much smaller quantity of seed in sowing such land. There is no need to sow clump rye *(secale multicaule)* upon such lands, as any good common seed increases very much upon so rich a soil, to which the burning of the surface has added so much of the vegetative power. The seed is sown in July or August, and is reaped about twelve months after."

* Coal ashes form an excellent manure for sour wet land, either used as a top-dressing for grass, or, if ploughed in, tend greatly to destroy the tenacity of stiff soils, and render them more productive.

out more quickly the moisture contained in the spongy peat; the thicker, therefore, it is laid on, the better. A thin sprinkling of lime over it, will add to its effect, and cause white clover, and other sweet grasses, to spring up in greater abundance. The most barren soil will have a good effect, when used in this manner; but, of all others, limestone gravel is preferable. By means of it, many extensive bogs are improved in Ireland, where it abounds; but very little of it is found either in England or Scotland, which renders that mode of improvement impracticable. After the ground has been thus treated, and lain some years in pasture, it may be broke up by tillage, and crops of grain taken, before being laid down with *grass-seeds*. By ploughing it, part of the natural soil will be turned up, and intimately mixed with the earth, &c. that has been laid upon it; and, if lime or dung is added, will altogether form a very fertile mould.

Such are the methods by which many bogs have been cultivated and improved after draining, in several parts of the kingdom, the success of which is a sufficient recommendation of the practice. But *these hints* are not to be considered as the only means whereby this improvement can be effected. There are others equally beneficial, and, in many situations, equally applicable; by means of which, there is no doubt that much *boggy ground*, however barren in its natural state, may soon be rendered highly productive; but to enumerate these, would be unnecessary; for every one who possesses ground of this description will be able to ascertain what mode of management is best calculated for its situation, what crops he wishes to raise, or what kinds of manure he has in his power to apply.

As no method yet practised for the improvement of moss has equalled, in produce and profit, that so successfully introduced by Mr. Smith, of Swinridge-Muir, in Ayrshire, a short account of the process, and result therefrom, may not be unacceptable to many readers. *

The moss is of two different kinds—the black, and the red or flow-moss. Both are are of a considerable depth, from four to twelve feet; but the first is reckoned more valuable, in several respects, than the other.

The first thing is, to mark out and cut proper drains (taking advantage of the declivity), to draw off the superfluous water, and to divide the moss into separate small enclosures. These drains, or ditches, are commonly eight feet wide at top, two feet at bottom, and four and a half feet deep, when first cut; but as the moss afterwards subsides, they become less; they cost 2*d*. per lineal yard. After these have been cut, and the moss thrown out has been spread from the sides, and the hollows filled up, the ridges are marked off, parallel to the sides of the enclosure, twenty feet in breadth. They are formed by leaving a space of twenty inches untouched in the middle of the ridge, and turning up on each side of this a furrow with the spade, which is laid over the untouched space, so as to raise it to a proper height above the sides. The whole breadth is then dug, by turning over, with the spade, furrows a foot in width, which has the appearance as if done by the plough. The division-furrows are small drains about two feet deep, and as wide, for drawing off the superfluous moisture, and conveying it into the main drains. The ridges must not be formed too high nor too narrow, nor the furrow-drains cut too deep; otherwise the moss will be left too dry, and consequently prevent the action of the lime which requires a certain degree of moisture to have a proper effect. * The next thing is *top-dressing* the ridges with *newly slacked, or powdered lime*, at the rate of 500 Winchester bushels per acre, † *i. e.* 250 bushels of shell-lime. The moss is prepared for the first crop early in the summer preceding; in which time the lime, aided by the effects of the different seasons, has so far meliorated the soil for the reception of the seed.

Potatoes planted in the *lazy-bed* way, ought always to be the first crop, when dung can be got. ‡ The potatoe-beds are formed across the ridges. A thin layer of dung is then spread over the beds, and the cuttings laid about a foot asunder, and covered (to the depth of a few inches) with the mould taken out of the trenches between the beds. When the plants appear above ground, they get another thin covering, by a second scouring of the trenches; and they require no hoeing till they are taken up. The produce is never less than forty or fifty bolls, of eight Winchester bushels, and the quality excellent. When the potatoe crop is removed, the ridges are again formed in the manner as before, and the division furrows cleared out.

In this state the ground remains till next spring, when oats are sown and harrowed in with a small harrow, drawn by men. The early oat is always preferred for seed, the late seed running too much to straw. The produce of the first two crops of oats is seldom less than ten bolls (of six Winchester bushels) per acre, and that of the succeeding crops, six or eight bolls, and often more. Five or six successive crops of oats are often taken, without receiving any additional manure, or exhausting the strength of the moss. By this time its nature has undergone a considerable change, and has now the appearance of a rich black mould, and is sown down with grass-seeds. It is not so favorable to the growth of barley, which is never sown before the first grass. When no dung can be had the first year, and oats taken with lime alone, the crop often misgives; which is a proof that, *without dung, and potatoes for the first crop*, it cannot be productive. The different kinds of marl are well adapted, and many sometimes serve as a substitute for lime; but dung is an inseparable appendage. After the process thus described

*The author visited Swinridge-Muir, when the moss was preparing for crop 1798; and this account of the process is from his own observation, and partly from what was communicated to him at the time. He takes this opportunitunity of testifying his regard for Mr. Smith, whose life, he has no doubt, has been *prolonged* by his *draining* and *improving* this large tract of moss, in the *centre* of which he has now attained the patriarchal age of *eighty!*

* In very dry weather, this may be remedied, by stopping the lower end of the drains, and retaining the water; and if there is a command of any spring, or higher water, it may be let into the main ditches; but too much moisture is likewise to be guarded against.

† Scotch; equal to one acre and one-fourth English.

‡ The quantity of dung is about eighteen or twenty single-horse cart-loads to an acre.

has been gone through, and the moss lain a few years in grass, it can be ploughed safely with horses; which lessens the annual expense of labor, without diminishing the produce. The spade is the only implement for the first years; and it is astonishing with what neatness and expedition the accustomed workmen perform the operation. It is sometimes ploughed the fourth year where the moss is not very deep.

When laid down with grass-seeds, the hay crop is often abundant, and the pasture, afterwards, worth £1 5*s.* per acre; which shows that the preceding oat crops have not exhausted too much of its strength. Rushes are very apt to grow up in the pasture; and the *poaching* of heavy cattle ought carefully to be avoided in *wet seasons.*

Abstract of the annual expense and profit per acre, for five years.

	Crops.	*Expense.*	*Profit.*
1st year	Potatoes,	£15 18 5	£0 11 7
2d "	Oats,	3 2 0	4 3 0
3d "	"	3 11 4	3 13 8
4th "	"	3 5 2	1 0 10
5th "	Hay,	0 12 0	3 4 8
		£26 8 11	£12 13 9

Average profit, £2 10 9 per annum, and will let for £1 5*s.* per acre, in pasture. By this, it does not seem so necessary to lay down with grass, after once manuring it, as in dry land; for the crops fail little in produce; and the great desideratum is to have plenty of straw for producing dung, so invariably requisite for the first crop. An intervening crop of turnips, however, would be an improvement in the rotation.

The different articles of expenditure making up this abstract, are stated at the highest rate, and the articles of produce equally low; so that, on the whole, it may be reckoned a fair average; but the distance from lime, in many places (which is here at hand), must alter the calculation, and increase the expense.

A great deal of moss has now been improved, by cultivating it in the same manner, in the counties of Ayr, Renfrew, and West-Lothian; and, indeed, these examples have been the means of inciting others to follow the same practice in different parts of Scotland, and which is every day becoming more general.

So far, these *hints* and *directions* were given in the editions of 1797 and 1801, and apply more particularly to *spring bogs*, *marshes*, and *peat-moss*. The following further observations and directions were communicated by the author to the Board of Agriculture in 1801, in a separate form; but were not then published. They are now added, as being connected with the subject. As there was a general scarcity in the country at that time, the Board recommended bringing into tillage all land that was capable of being drained and brought into cultivation, at a remunerating expense; and accordingly the substance of what follows was then communicated.

There is certainly no other means by which a sufficiency of grain for the maintenance of the people, and of improved pasture for that of live stock, can be accomplished, than by that under consideration.

A great portion of the land under this description, is, in its present state, altogether unproductive; but when drained and cultivated in the manner recommended, would become valuable, either under a regular rotation of cropping, or, after being properly laid down, kept in permanent pasture.

There are various circumstances which must guide the possessors of such land in the mode of treating it, which cannot be fully adverted to; but the general hints and directions here given, relative to the different soils, &c. it is presumed will apply to most cases.

I. *Very old pastures, over-run with rushes, fog, or moss, that have been long out of cultivation, but where the soil is strong, and the climate is good.*

In regard to *ploughing* ground of this description for the *first* crop *it* ought to be *deep*, in order more effectually to bury the moss, * and bring up a *fresh* mould, which, besides, will render the crop less luxuriant in straw, and consequently not so apt to *lodge*; and next year's ploughing in the same way (deep) will expose, in a more mature state, the surface that has been turned down the year previous.

In soils of this description and quality, the great object is to obtain *two* valuable crops in the two *first* years, without the aid of manure, or the intervention of a green crop or summer fallow, when such management does not tend to deterirate, or exhaust the productive powers of the soil. Therefore, in this case, the first and second crops may be oats. If the ground has been in tillage before, though long neglected, and has been limed before being last laid down in grass, or has been top-dressed with lime in the course of its being in pasture, there will be no need for giving it more lime during these two crops. If it has not been limed, or at so early a period that its effects may now be exhausted, it will not be advisable to put on the lime till the *third* year, as will afterwards be noticed. It will be necessary to attend, in the first place to the proper ploughing and harrowing; as by that, a material saving of seed will be gained. When the furrows are laid over unequally, too thick, or too broad, openings are left between, and in these interstices an unnecessary quantity of seed is swallowed up, which either never vegetates, of it does, is so weak as to be good for nothing. To remedy this, the simple plan is, to give the ground a slight harrowing *up and down* (not across) the ridges, by which the openings between the furrows will be so much filled up as not to endanger the seed. Indeed this will be attended with another advantage, that of encouraging the whole to come up more early and regular, than would otherwise be the case. All the harrowings should be given in the same way, as there is a risk of reverting the furrows when done cross-ways. Rolling, too, is useful in this case, to destroy slugs and worms which infest ground of this kind in the first crop, and which are often very destructive. As to the form of the ridges, none can be prescribed for the first two years, but to plough the land in the same shape

* Moss, here means, what in Scotland is called fog, of so thick and close a texture as to destroy, in a great measure, the growth of any nutritive grasses.

as it may have been before, even though the ridges should be broad, crooked, and unequal. Improving the ridges, by levelling and straightening, will be better performed during the third year.

The whole of this soil, the third year, should be under green crop, with the usual preparation and manure. It would be needless to say what manure is best adapted, or how it should be applied, as these circumstances depend entirely upon the various situations in which such land may be placed. The lime necessary should be spread on and ploughed in with the last furrow only, if the ridges require any levelling or new forming; but if not, this rule need not be adhered to, and the lime may be laid on after the first ploughing, by which means it will be more intimately mixed with the soil. If there is not a command of dung for the whole of the soil that may have been broken up, and it may not be convenient to have the whole under potatoes or turnips, the remainder cannot be better occupied than in tares or vetches, which, cut green in the end of summer, will afford excellent feeding for the working horses. By the consumption of these in the house, a sufficient portion of dung may be made for manuring this part of the ground for next crop.

The application of the turnip to stall-feeding, or eating off with sheep, either on the turnip-ground in hurdles, or by the same kind of shifting inclosure, in an adjoining field, will depend on circumstances. Where the ground has been sufficiently manured, it would be preposterous to feed them off in the field where they grow; and in this case, they should be carted off, either to the house-feeding, if that is wanted; or to be eaten with sheep on some grass inclosure that is to be broken up, and is in need of manure, or perhaps, as a top-dressing to some stinted pasture; or, part of them may be eaten off with sheep on that portion of ground which had got no dung, and had been under tares.

It is found to answer well, and prove very beneficial, to take up part of the turnips early in the season, when they are in the most nutritive state, and by cutting off the *shaws* (leaves), to pile them up in small stacks or heaps, securely covered with straw within a house or shed; and in this state, if the frost be excluded, they will keep sound for several months. * It is of consequence to clear the ground in this way, when the succeeding crop is to be wheat, and when the consumpt cannot be so immediate as to clear it otherwise. When barley or oats is to be the next crop, it is not so material; but at all events, the saving from frost is a great desideratum, and therefore, worth attending to; and having them always at hand when the ground may be covered with snow, and thereby a difficulty in collecting and carting them off. In this class of soils, and where the climate and other circumstances favor it, wheat should be the fourth and last crop sown down with grass-seeds. As the chief object may be, to get this land soon again into pasture, only one cutting for hay should be taken, and the after-grass not too closely eaten down.

By the management and rotation here specified, it is evident, that a very great additional supply of grain will be produced, without deteriorating the soil so much as to render its future produce in grass less valuable; but on the contrary, it will be so much refreshed and renewed, as afterwards to yield an abundance of good pasture, in place of remaining in its former unproductive and unprofitable state.

II. *Old pastures, wet and over-run with rushes and coarse grasses; the soil clay, or clay-loam.*

So soon as the draining is finished, which ought to be in October (or before, if it can be accomplished), the rushes should be closely cut by a strong, short, and broad scythe, made for the purpose; and the ground ploughed with a deep furrow, so as to bury the stools, and expose the roots and seed-bed to the winter's frost. What part of this soil may not be so wet and rushy, should not be ploughed with a deep furrow, but with one of eight inches broad and six inches deep. This ground should be limed on the sward (surface) with newly slacked lime, and immediately ploughed in. The first crop invariably should be oats, and the second may be beans and peas broadcast; or drilled, if the soil be sufficiently pulverized by cross-ploughing and harrowing. No ground, unless it be very foul, and absolutely unfit for green crop, should be put under fallow, as thereby a crop is lost; but neither of these (over-foulness, or too tenacious a soil,) can be the case with the ground here alluded to, after the previous treatment it has undergone. Indeed, the nature of the soil is not adapted to such green crops as turnip and potatoes; but a profitable crop of drilled beans, or of cabbage, may be raised, while the ground is undergoing (by the necessary operations of hoeing and cleaning) a state of preparation nearly equal to that of a fallow.

The fourth and last year, this ground should be sown with barley and grass-seeds. Barley in this case is preferable to oats, because the soil being close and retentive, there is more time to prepare and pulverize it by frequent ploughings, &c. for the reception of the seed. As it should only be cut one year for hay, the quantity of pasture grass seeds should be in a fuller proportion.

III. *Light soil inclining to sand.*

This should be broke up with a crop of oats the first year, and with a very light furrow. Next year's crop should be turnip, manured with a compound of lime and strong earth, such as scourings of ditches, cleanings of ponds, &c., or clay marl where it can be had; and the turnips should be fed off on the same ground, either with sheep or black cattle, in hurdles. The turnip, in this case, may be sown in broad cast, with a less proportion of manure, as that from the sheep or cattle, while eating them off, will add a store of matter to enrich the soil, and the trampling and treading, &c. will help to consolidate the looseness of it. Barley, with grass-seeds, next year (the third), will not fail to be a good crop; and it will be pre-

* There is an excellent method of preserving turnips, by cutting off the *shaws* and *tap-root*, and setting them in regular layers on old pasture. The bottom part immediately sends out fibres through the grass, and preserves the bulb or body of the the turnip *entire* for several months. Straw or grass laid over them, excludes the frost, and so prolongs their nutritive qualities.

ferable to sow only for pasture; in which case, less red clover, and a larger proportion of white and yellow, will be proper.

In this light and loose soil, the grass-seeds should be sown after the barley has got *one* harrowing; and it will be necessary to roll it well when the other course of harrowing has been completed. There may be other rotations for this kind of soil, but none better adapted to it; nor any that will return a profit so easily, and leave it again in an *improved* state of pasture.

IV. *Another class of light soils, wet, the pasture stinted and unproductive.*

Here, the surface being less rugged and uneven, it may be manured on the sward with a compound of lime, earth, and farm-yard dung, at the rate of 100 cart-loads per acre. This should be ploughed down in the months of October and November, and sown with oats early in spring. The second crop should be peas with two furrows; and the third and last crop, oats, with grass-seeds, for pasture only. The compound should be made up some months previous to its being used as manure; and should be once turned over, to accelerate its decomposition, and render it more easily incorporated with the soil.

V. *Another class of similar soil, having the surface over-run with coarse grass, heath, &c.*

If this soil is of sufficient depth, it will be advisable to pare and burn it before the first crop. * When this is done, 150 bushels of well slacked lime to the acre should be spread on it, along with the ashes, which will ensure a good crop of oats. The second year, potatoes or turnip; and for the third and last crop, barley or oats, with grass-seeds, for pasture only.

There are the different classes of soil, with the mode of management, that were proposed to be treated of in this part of the Appendix, as being those which most generally occur. Modifications of culture may be judged of and applied by the occupiers; but the leading object, after draining, is to overcome the barren and unproductive state in which they lie; but not, by *over-cropping*, to exhaust or deteriorate them; and after being managed in the manner described, to let them remain *at rest* for some years, when they will be better able to undergo a more extended course of cropping, and become still more fertile and productive.

GENERAL CONCLUSION.

In the preceding pages, I have endeavored to explain, in as precise and explicit a manner as the subjects admit, the various circumstances, principles, and data on which the 'Art of Draining Land' is founded; as also, the manner of its application in every practicable case; with such directions to guide the execution, as, I hope, will enable every practical farmer to profit by the discovery of the late Mr. Elkington, in the drainage of those more *intricate* cases to which *his system* applies: and also, to apply the more usual modes of hollow and surface draining, which are still very much practised in both parts of the kingdom; and which, in many cases, are the only kind applicable.

Of embankments, I have given a pretty full detail, with practical directions applicable to their various situations, and forms of construction. And lastly, in the preceding Appendix, I have given such hints and directions as may be useful, not to the experienced and more practical farmer, but to those who are not *yet* so fully acquainted with the culture and improvement of *wet* and *unproductive* land, *after* it has been drained.

I have treated these subjects, *in all their various branches*, with that degree of confidence, which the experience of a long and successful practice has enabled me to do; and it will afford me peculiar satisfaction, if this *work* shall contribute, in any degree, to the extension of the knowledge and practical application of these important objects, so likely to promote the interest of the landed proprietor, the farmer and the public in general.

JOHN JOHNSTONE.

Lauriston Lodge. Edinburgh, December, 1834.

From the Cultivator.

EGYPTIAN WHEAT.

This was spoken of, with the other varieties of spring wheat, in our September number, volume iv. Since that time, our attention has been particularly turned to this grain, by the receipt of several parcels kindly sent us, and by repeated inquiries where the seed could be purchased, and at what price. It has also been highly commended in the news journals.

This wheat is known under the various names of *Egyptian, Syrian, Smyrna, many spiked, reed, and wild-goose* wheat. It derives its latter name from a story, which is current in the north, that four or five kernels, from which the American stock has proceeded, was found in the crop of a wild goose, which was shot about four years ago, on the west shore of Lake Champlain. It is called *reed* wheat from the great strength of its straw, which serves to prevent its being prostrated in the field.

The first notice we have of this species of wheat in the United States, is in the 'Memoirs of the Philadelphia Society for Promoting Agriculture.' A parcel of it was received in 1807, by the society, from Gen. Armstrong, then our minister at Paris. This grain was grown five or six years by Judge Peters, and proved to be very productive; a pint of seed, sown in drills and hoed, giving one bushel and a peck of grain. But we find the judge saying, after three or four years' trial, that it had not "thriven so as to encourage extensive culture." In a more *southern* latitude, he expresses a belief that it would do well. It was extensively distributed; but from our not having heard more about it in the last twenty-six years, we believed it had not proven a valuable accession to our husbandry.

We have seen beautiful fields of this wheat. We sowed a sample specimen two years ago, but on being assured by a friend that it was inferior for flour, we gave it up. In the Philadelphia edi-

* Though this, in practice, is now almost exploded, it is the best method of subduing such herbage.

tion of the 'Domestic Encyclopœdia,' printed in 1821, we find it stated, that this kind of grain does not yield so much flour or meal as any of the other kinds of wheat, and that "the flour is scarcely superior to that obtained from the finest barley."

Having said thus much, which we felt bound to say in the line of duty, as to the character and introduction of this grain into our country—it remains only for us to add, that the seed may be procured of *our* friend Mr. Thorburn, at *five* dollars a bushel.

REMARKS ON AGRICULTURAL HOBBIES AND HUMBUGS.

We had designed, long ago, to submit, more at length than heretofore, remarks on a class of subjects which may be comprised under the general designation of "agricultural hobbies and humbugs;" to which might be added, "agricultural frauds," if it were not improper and offensive to place in juxta-position the designing deceivers, and the deceived; that is, some of the most knavish of the agricultural profession, with many of the most disinterested, honorable, and public-spirited. But so it is—by the united operations of the cheats and their dupes, (who, being deceived themselves, innocently aid in deceiving others,) there is a perpetual succession, in the agricultural and other papers, of agricultural humbugs and deceptions, by which a few make large profits, and many find disappointment and loss. We have heretofore, though concisely, and as incidental to particular subjects, expressed opinions designed to oppose the progress of this evil; and similar views were more generally expressed by our friend, James M. Garnett, esq. in his last 'Address,' published in this work. Still, there remains an ample field of humbug to treat of, and to expose.

There are various modes of practice, in this branch of business; but the most usual is the following: Some new variety of corn, wheat, or other crop, is announced, and recommended as being superior in production and value, to any thing known before. This statement may be partially true, or altogether mistaken—and in either case, the publication may have been made with honest and praiseworthy intentions. On the other hand, the first motive of the publication, as well as the final effect, may have been to make dupes, and to get hold of their money. According to these, or other circumstances, the early publication either contains, or is afterwards followed by, a notification that Mr. Such-a-one offers to sell seed or plants of this rare and valuable variety, at a price three or four times, or it may be ten times, as high as is usual, or as would be a sufficient remuneration for the raising. The enthusiastic and credulous, among the readers of these highly-wrought panegyrics, are put all agog to obtain seeds which, as represented, alone will add 30 per cent. to their crops. The regular seedsmen hasten to give their orders, that they may profit by the new demand, just as milliners would for bonnets of the latest fashion, and knowing well that the fashion will be as likely to be transient in the one case as the other. The editors and publishers of agricultural journals, who are not themselves seedsmen, find that articles on these wonderful new products are interesting to many of their readers, and very convenient to fill their columns; and therefore, they help on its way every successive humbug, and the more wonderful the account, the more sure it is of being selected for republication. But if the publisher is himself engaged, directly or indirectly, in the selling of seeds, &c. (which is a usual, because a very convenient and profitable combination of trades,) then he can best profit by his readers' appetite for novelties and wonders; for he can not only start and direct the puffs, but such recommendations are, beyond comparison, the most effective of advertisements, because not suspected to be such, nor to be otherwise than the honest and disinterested opinions of the writers. *We*, who have no such connexion with seedsmen or others, and have no such private interest to forward—and who have treated with distrust, scorn and contempt, all efforts to buy of us editorial puffs—yet even *we* can scarcely avoid giving some help to the progress of this widely-spread puffing system; for so many articles in agricultural and other publications partake of this character, without its being apparent, that it is impossible to know all such, and thereby to exclude them from our pages, or to mark them with deserved reprobation, when published. We have always been very scrupulous and cautious on this head; and certainly have never aided, knowingly, any such plan of deception. Still, in selecting for republication the current articles of the day, from other journals, such as notices of particular heavy products, new and valuable seeds, plants, live-stock, and farming implements, we may have been, unconsciously, helping to extend the circulation and effect of a salesman's disguised puff. If we were to discard our scruples, and, instead of neglecting or opposing, were fully to sustain the puffing system, our publication would have many more articles of temporary interest to readers, and in more ways than one, would be productive of much more profit to the publisher.

But this is not all that we suffer from the great and ever-changing demand created and maintained for new seeds, &c. Our remote readers, believing (and very correctly) that we are always pleased to serve them individually, as well as to forward the improvement of agriculture in every department, frequently write to request our aid in procuring for them seed of spring wheat, twin corn, Baden corn, &c. or others of the highly-praised varieties which are successively *elbowing* each other out of notice. We have done our best in such cases, and sometimes at as much gratuitous trouble and expense, as the article in question was worth; even when we had little hope of being successful in the safe transmission; for owing to the difficulties which any one who is not practically engaged in, or acquainted with, commercial business, finds in transmitting articles through circuitous routes, and various conveyances, and by sundry agents, it is probable that not one such venture, in three, reaches its destination safely, after all the trouble and care taken. The regular seedsmen and traders can do better in this respect; and they can not only send any new hobby to any destination, (for price enough,) but moreover, they will generally have a *better* one ready for sale, before the first will have reached its distant buyer.

Since the first commencement of agricultural jour-

nals in the United States, there have been many articles announced as new and valuable, puffed into notoriety, thence eagerly sought after by purchasers, tried, and found wanting—and finally abandoned and forgotten. And it is so much more pleasing to mankind to be flattered by vain hopes, and be deceived, than to be warned of the danger of, and guarded against deception, that editors will always advance the popularity of their publications, by floating with the general current, and falling in with every such fashionable error, while it lasts. By thus flattering and ministering to the fancies of the ardent and sanguine, (who are also generally the most zealous and active,) among their readers, *at least to them* they will render the publications most interesting. And though almost every new hobby may, in its turn, be found worthless, yet but few readers will find fault of the favor previously shown. All that the editor has to do, is to dismount, silently and quietly, from the exposed and disgraced hobby, and mount the next one that seems most likely to engage attention and interest.

With such aid, and by such recommendations, the public attention has been at different times solicited to not only various new varieties of the more important grain crops, but also to such minor articles of cultivation, as millet, (of various kinds,) the bene plant, Cobbett's "Russian turnips," (which, as *Swedish turnips*, had been long known, and valued for their real advantages, in England, and treated of in English books, but which it required humbug and false appreciation to bring it into use here—); and as great expectations of profit were thereon built, as are now on spring wheat and the several new kinds of prolific corn; and as probably soon will be, on the Egyptian, or many-headed wheat.

Do not let us be understood as denying all value to these over-rated novelties—nor as wishing to discourage trials of new plants, or new (supposed) improvements of any kind. On the contrary, we would encourage trials, if made carefully and accurately, as being calculated not only to amuse and gratify all cultivators of inquiring minds, but also as sometimes leading to results which, if correctly appreciated, will be of important value to agriculture. But we *do* mean to avow a very general distrust of these many newly discovered values in particular varieties of seeds, &c. and especially when it is manifest that he who makes or sustains the recommendation of the article, has a private and pecuniary interest in raising it's reputation, or maintaining for it a high selling price. Let all the attendant and connected circumstances be borne in mind, and the trials be economically, as well as cautiously and accurately made, and we would urge the trial of every new thing that was even plausibly recommended.

In addition to all the supposed more productive kinds of grain, which have been made generally known to the agricultural public, there are hundreds of individual farmers who, silently and privately, cherish their own particalar fancies as to the superiority of their own selections. One aims, by selection of seed, to get the *deepest grained* corn, because an ear of such must have much more grain than one of equal size, but shallow-grained; and thence he erroneously infers that the former kind will be much the most productive to the acre. Many, not content with deep grains, seek for the smallest sized cobs—that the larger proportion of each ear may be of grain rather than of cob. On the contrary, John Taylor, our great and distinguished agriculturist, preferred ears with the largest cobs, for seed, because, as is evidently and mathematically true, if the grains are of equal size, there will be more of them encircling a large than a small cob. Some seek for *large* ears; others for *many* ears upon one stalk. Many farmers are as curious and particular in selecting seed-wheat, either for the large size of the grain, the large number of grains in the head, the large number of stalks and quantity of grain from a single seed; and all confide equally in thereby securing more product in general, from the land. Now we have no faith in any of these modes of reasoning, and therefore none in the supposed results. Without denying that particular varieties of plants may be somewhat more productive than others which are equally suitable to the same soil and climate—and admitting that the smallest well ascertained advantage of superiority is worth securing—yet, in general, and in the absence of all positive proofs of exceptions, we maintain that corn, or wheat, or other grains, will produce according to the degree of fertility and mode of cultivation of the soil, and according to the adaptation of the kinds of grain to the soil, climate and season. Perhaps every variety of grain may be the most productive in some particular situation and season; for all varieties are produced by nature, in the never-ceasing effort to accommodate a misplaced plant to its new, and comparatively, inhospitable location or circumstances. It is highly important to adapt the kind of seed to the soil, climate, and usual seasons; and the want of such adaptation may reduce a crop to less than half of what might have been obtained from other seed. But we have not the slightest faith in any of the many prevailing opinions, that larger crops are to be obtained by choosing seed on account of the form, size, or number of grains, or the size or number of ears, &c. Indeed, (as we stated in a former volume, when touching incidentally on this subject,) when ears of corn, wheat, or other grain, are remarkably large, for the particular variety grown, or a single root is remarkably productive, either in number or size of ears, or quantity of grain, it furnishes sufficient evidence of insufficient product from the land; or in other words, that there was too little seed to the acre; and that a greater number of stalks would have yielded a better crop, though by reducing the product of every individual stalk.

These views are not opposed to the fact, that the Maryland twin corn, the Baden corn, or the Dutton corn, (for example) in certain situations, may be more productive than our ordinary kinds. But they are utterly opposed to the belief of either of these varieties, or any other, being more productive in *all*, or in *most* situations—or of being more productive *in a very great degree*, in *any* situation. Mr. Carmichael, who was among the first to recommend the Maryland twin corn, through the pages of the Farmers' Register—and whom we still deem among the best authori-

ties, on account of having full experience and means for observation and comparison—confined his recommendation within the following limits: "My experience" (he says, at p. 605, vol. 2.) "induces me to think that no great advantage is derived if this corn is planted on lands naturally poor, or exhausted by cultivation; but where in a state of fertility, either naturally or by improvements, I think the [increase of] product from this kind of corn will be more than fifteen per cent." Now this amount of increase, if accurately estimated, is sufficiently great to induce the trial of this corn, on the soils recommended as suitable, and in a latitude not very different from that of Queen Ann's county, Md. But this increase is far short of what the sanguine expect, or what would have induced so many to require this kind of grain; and the writer entirely objects to planting it on any but the very small proportion of *rich lands*. This corn is a *forward* kind, even in Maryland; of course it is too forward for our location; and in southern Alabama, and lower South Carolina, it will lose the benefit of near or quite two months of the growing season, which the longer summers there offer to vegetation. This corn will there become, under Nature's correcting training, more and more late in ripening, and the ears larger and fewer; and we believe that Nature knows best how to adapt particular grains to particular soils and climates, and that the more the Maryland twin-corn shall be changed by her efforts, from its present and most highly prized peculiarities, the more productive it will be in southern regions.

Neither do these views contradict others which we have advocated, deduced from the valuable article of Dr. Bronn, in vol. 1, (at page 257) of this journal. Our deductions then made, and still adhered to, were, that northern and moist climates, and clay and cold soils, tended to increase the vegetable (or the stem and leaf) parts of a crop, at the expense of the perfection of the seed; and that southern and dry climates, and hot or sandy soils, made the seed more perfect, but diminished the succulence and size of the plant in general. And, as the first progeny would partake largely of the peculiar qualities of the parent stock, it was therefore proper to bring our grass seeds from the most cold and moist situations, and the seeds of crops, valued mostly for the grain, from the warmest and dryest. We may gain, in this manner, in the particular product most wanting, though at the cost of some general reduction of the product of the entire plant or crop. But, to have a tenth, only, added to the bulk of the stalk and leaf of a clover or other grass crop, wanted for hay, pasture, or green manure, we might well afford that it should be incapable of bringing the half of a usual crop of seed; and we would be very unwilling (by change of seed, or otherwise,) to double our growth of wheat-straw, by lessening the grain only one-tenth. Both these effects, or something like them in degree, we believe might be produced by bringing grass and grain seed, from far northern regions, to be sown in the south; and in a less degree, by changes of seed from cold and moist, to hot and dry soils, on the same farm.

But this is a digression from humbugs and hobbies—or perhaps, as may be charged, from those of other people, to some of our own. We do not claim exemption from the liability of being deceived in such matters, nor, in consequence, of thence aiding to deceive our readers. But we claim *this* at least, that we do not *sell* our humbugs, nor make any pecuniary gain in the humbug market. If we aid in forwarding deception, it is done disinterestedly and honestly. To return then to the subject.

The Baden corn seems now to be the most fashionable and popular variety. The following extracts will show the claims made for it to public favor. The first is a letter from the commissioner of the Patent Office, who exhibits a laudable, though in this respect an ill-directed, zeal for the improvement of agriculture; and the second is the material part of the letter to him from Mr. T. N. Baden, the producer and seller of the corn.

"To the Editor of the Farmer and Gardener.

Patent Office, Dec. 12, 1837.

"Dear Sir—I have received many inquiries respecting the culture of "Baden corn," and addressed a letter to Mr. Baden on the subject. I take the liberty of enclosing his letter for publication in your valuable paper.

"Mr. Baden's experiments this season, show that his own is earlier than many other kinds. I have distributed the last year a great number of parcels of the Baden corn; that which has been planted in latitude not exceeding 40 or 45 north, has succeeded admirably. It will soon be acclimated in the higher latitudes. Over 100 bushels has been raised per acre on the rich lands of the west and south, without any manure.

Yours, respectfully,

H. L. Ellsworth."

"To the Hon. Henry L. Ellsworth,

Washington City.

Prince George's County, Md., Nov. 4th, 1837.

"Dear Sir,—Agreeably to promise, I now write you a few lines to inform you, that within the last two years (and never before) there has been a report in circulation that my corn was a latter kind. However, for the satisfaction of my friends, I have made an experiment this year, which I hope will satisfy every one upon that point. I planted a lot of six acres and a half, as near as I could judge, (by stepping) of this kind of corn, the 20th day of May last—my book is now before me. I cannot be mistaken in the date, which is more than a month later than the common time of many persons planting in this neighborhood. I gave no extra management to hurry its growth, and determined to give it only the common routine of work that I generally give my corn. It is now perfectly ripe and hard, and has been for some time, and no frost could do it any injury in any way; and I believe it will yield as much good sound corn to the acre as any that was planted in the neighborhood any time in April upon land of the same quality. This evidently shows that my corn is a forward kind, and will come to maturity as soon as any other. By the first opportunity, I will send you a few stalks of this corn that was planted the 1st day of May, with the corn on them, as it grew in both the lot and field, and none with less than *four*, and some with *seven and eight good ears on a stalk*—then I will leave you to judge which of them is the better. As soon as it is sufficiently dry to shell and put up, I shall send you twenty or thirty bushels of as good seed corn as you have ever seen. I have not long since discovered something in this corn, which convinces me that I can still make a great improvement on it, by adding much to the quantity and quality of the grain on each stalk. I am now persevering in my efforts,

and intend to raise a large crop every year in its purity, to supply all who may apply for it for seed.

* * * * * *

"P. S. I can ship any seed that may be ordered each week to Baltimore, if a few days are excepted when navigation is interrupted by the ice."

The grossest, and yet the most profitable fraud that has been practiced, was by an Irishman named Hall, who went through the country (in or about the year 1815,) selling patent rights (as he pretended) for a discovery of his in cultivating corn; by means of which, two laborers only, without horse or plough, and on ordinary land, could make a crop of 2500 bushels of corn, annually. His plan was to lay off a field regularly into squares of nine feet; and one of these squares in each contiguous nine, was to be manured and cultivated, and to bear as many stalks, and (as he promised) was to yield as much product, as the whole space of nine squares, if the whole had been ploughed and planted over equally, as in the usual mode; and each square was to be thus cropped in succession, so as to make a nine-years rotation on the same field. According to his reasoning, the thickly standing corn on each planted chequer, would be benefited by the surrounding vacant eight squares; and yet these eight would be resting and improving, until the turn of each came, in succession, to bear the crop. This impudent impostor did not even exhibit his patent right which he claimed to possess—nor had he any valid testimonials of the worth either of his plan, or his character. His whole means of success consisted in the enormous profits which he promised. It was as if an agricultural Aladdin's lamp had been offered to every farmer. His terms too were very moderate; he asked only $10 in hand, to permit the exercise of his right; and $40 more were to be paid after the first crop had been gathered, and the plan found to be entirely satisfactory. It is true that Hall did not make many converts; but, so far as we heard of his movements, in lower Virginia, he succeeded in making sales to some five to ten farmers in almost every county which he visited during his rapid progress. With these advanced payments he was content; at least he never returned to ask for the much larger balance remaining due. It was still more remarkable, that most of the persons who paid for Hall's plan, were not experimenters, but such as were called "solid, practical farmers," who had been previously eschewers and despisers of all theory and book-farming; and many were old men, who had never before varied from the time-honored usages of their neighborhood. But few of them even tried this dearly bought privilege; for they became heartily ashamed of their bargain before the planting time arrived. Those who *did* try it, made scarcely any crop, and never repeated the experiment.

The merino sheep humbug was of a still earlier date. When the invasion and devastation of Spain by the French served to break up the great merino flocks in that country, and to remove the previous prohibitions to the exportation of sheep of the best breeds, the opportunity was judiciously availed of to supply this country with a truly valuable stock. But the high prices obtained for them generated and nourished a spirit of speculation, such as has been exhibited in sundry other commodities, in various regions and times; as in tulip roots in Holland—lots and lands in and about Richmond, formerly—and lands and sites for future towns in many parts of the western wilderness, recently. The source and the progress of all such bubbles may be stated in a few words. The increased price has no relation to the intrinsic value (or productive use) of the commodity. But whether it be a tulip root or a merino sheep—a vacant and useless lot in a city, or the site of a prospective town in a marsh or a wilderness—the process is the same. The article in question rises in market price (whether by accident, by depreciation of money caused by excessive bank issues, or aome other delusion, or by the art of the holders,) say 50 per cent. in a few months, and is sold by A. to B. at that rate of profit. C. buys of B. at a proportional advance, simply because of the rise in price which had taken place, and therefore still expected to advance. Probably he is not disappointed in that expectation; and whether he embarked in the speculation as knave or as dupe, *he* also makes a large profit by selling to D. who is still more eager to buy, that he may not lose his chance for such great profit, the regular advance of which has established confidence in a still continued enhancement of price. Thus the game goes on. The greater and the more rapid the rise in price, the more eager are the buyers; and every one concerned is making large profits—or is made rich, if operating on a scale large enough—until the bubble of speculation can be no more distended, and of course bursts; and the price then is adjusted to *intrinsic*, instead of speculative value. In this way, merino sheep at one time sold in some cases for more than $1000 each. We have before touched slightly on this subject; and expressed the opinion that a like mania was now growing as to race horses, and the improved breeds of cattle.

Another humbug was Mr. Whitmarsh's seed of the Chinese mulberry—which has been fully exposed in the past volume of this journal. The circumstances afford a strong exemplification of the fact, that the public are better pleased to be deceived than to be undeceived; and that if both false promises and means for their correction are presented to readers, that most will grasp at the falsehood, and pass the truth either unnoticed or unbelieved. Before any seed (real or supposed) of the *morus malticaulis* had been offered for sale in this country, we published in this journal, and upon high authority, that these seeds would not produce the parent kind, and therefore were not worth planting. This fact we repeated, and endeavored to enforce, from time to time—but without the notification seeming to have the least effect in preventing error, or staying the frauds of sellers, or the losses of buyers of the seed. The humbug had its course—the sellers made their profit—and now all are content to acknowledge the truth that might have been known as well at first.

The last prevailing humbug is *spring wheat*. Of the value of this newly introduced, or rather re-introduced old variety—for spring wheat is no novelty to well informed agriculturists—we have before intimated our

distrust. Nevertheless, hundreds are eagerly seeking seed of spring wheat at $4 and $5 the bushel—and as long as such prices can be obtained, the humbug will live—and no longer. It has already been settled, that *some* kind of this wonderful spring wheat is not worth sowing; but then, it is affirmed that *that kind* was not the "real Simon Pure"—and half a dozen other kinds will be successively offered as the best, paid for at enormous prices, and found alike wanting. Some of the sellers of spring wheat seed are already quarrelling with each other, as to the merits or demerits of their respective kinds, as is shown by the following extracts from late publications.

"*Italian and Siberian Spring Wheat.*—We published in our paper of the 16th instant, a communication from Dr. Goodsell, of Utica, New York, comparing the relative virtues of these grains, and decrying those of the former in no measured terms. Desiring to exercise the strictest impartiality, and at the same time to lay every thing touching agricultural subjects before our readers which in the least interests them, we have published in this day's paper two letters in reply, from Mr. Jay Hathaway, the gentleman who introduced the Italian spring wheat into the culture of this country. Without making ourself at all a party to this controversy, we must express our regret that topics of the kind should be so conducted as to call forth any thing which can be tortured into motives of a sinister character. It is but natural that men should be partial to products of their own; self-love inclines us to the adoption of such opinion; but we can see no reason why one man, who may be satisfied with his own commodity, should step out of his way to attack that belonging to his neighbor."—*Farmer & Gardener.*

The tone of the champion of the Siberian spring wheat, may be inferred from the comments. One of the replies of him who sustains (and is sustained by) the Italian spring wheat, is copied below in full.

"Dr. Goodsell of Utica, has come out in the "Cultivator," (Judge Buel's paper,) strongly recommending his Siberian Wheat, and running down or trying to depreciate the Italian. His letter may possibly hurt the sale of the Italian, where it has not been proven; but in this county, the experience of our whole farming population is against him, and his letter here is quite harmless. Mr. Jos. Wright, a first-rate farmer of this town, has sowed the Siberian three years in succession. His first crop was fair—his second was poor—and his third was miserable. I do not certainly know of any other person in this place who has raised it, and it must have very rich land, whereas the Italian does not require it, and will do *well* where the Siberian will not grow at all. The Italian is not liable to rust, let Goodsell say what he will. He is jealous of the fame of the Italian.

Yours, &c. J. HATHAWAY.

The above valuable wheat for seed, may be had (direct from Jay Hathaway, Rome, N. Y.) by applying to John L. Peirce, Bull's Head, North Third-street, Philadelphia, at $4 50 per bushel, by the single barrel. A barrel contains about 3⅛ bushels.

Philada., Penn., Jan. 23, 1838."

A previous and longer reply in the 'Cultivator,' from Mr. Hathaway, contains the following comparative estimate. The Italian spring wheat is declared to have been raised in "numerous cases, from impoverished lands, that would not yield a crop of oats. *This property alone* should give the Italian spring wheat a name above every other, as no other in this country possesses one so valuable, except such as are in common; none other will grow well, and *produce a good crop upon a poor and worn-out soil,* It has been grown for five seasons in this county, and has not failed in any; it rarely ever rusts, although winter wheat is ruined all around it; it has justly obtained an enviable popularity, as the doctor knows, as a sure crop, a good crop, and a larger;—it is the only article about which there was scarce a difference of opinion, until the letter in question: here it will effect little—abroad it may prevent a million from enjoying a certain good, which unlike the other, has not yet to *establish* a reputation. A "single swallow does not make summer"—nor the yield of a single field fix unqualified by a character. Many folks make wild *guesses:* the doctor says his Quaker friend "*thinks*" that he shall thresh nearly or quite 40 bushels Siberian from one bushel sown. Now this is great, if he has *guessed* truly; yet I can tell him of a man who says he sowed but half a bushel of Italian wheat on an acre of land, and that it yielded him 30 bushels after being threshed, and his account is not *guess* work."

Our inference from this correspondence is, that Mr. Hathaway has already made a pretty penny by *his* spring wheat; and that it is time he should make way for some other public benefactor.

A late occurrence, which will he described as an illustration of some of the foregoing remarks, presented to us, both forcibly and ludicrously, the manner in which humbugs operate.

A highly esteemed and intimate friend, who is a member of one of the learned professions, and no farmer, had lately thrown upon his hands the general direction of a landed estate. Our friend is a regular though cursory reader of the Farmer's Register; and he had been forcibly struck with some of the statements published of the product and great value of spring wheat, which he had seen there, and the far more seducing accounts in other publications; and had not paid so much, if indeed any attention, to our expressed doubts of its value, and warnings against confiding in it as a crop. Under the impressions thus formed, he came to consult us as to a matter of practical farming; and the following was precisely the substance of his statement and inquiry. "There is a piece of ground, of 10 acres on the M——— farm, which was reserved and prepared for oats. It is but of moderate strength, and as I am told, would probably have brought 10 bushels of wheat to the acre, if sown last fall. Now the question is, would it not be the best thing I could do with it, to sow *spring wheat,* instead of oats? I see by advertisements that that grain is selling for seed at $5 the bushel. Now, if I were to buy and sow only 5 bushels on the 10 acres—(so as to make the most of the seed—) and reap only 60 bushels of product—which surely is a *very* moderate calculation—and supposing that my crop would sell for *no more* than $4 the bushel (—for I wish to be sure to be within reasonable bounds—) and still I shall get $22 50 an acre, after paying for the seed."—It did not require much trouble to persuade our friend that his scheme was nought, in regard to his own interest. But perhaps it may not be so, as to the public interest; for the account of it which we take the liberty here to give, may possibly serve to save to some others of our readers fully as much money as he had expected to make by spring wheat. He will be not a little surprised, however, to find himself made use of to oppose the progress of humbugging.

The description, on a previous page, of the Egyptian

wheat, however cautiously or correctly stated, is very likely, without any such design, to produce a very general anxiety to possess so curious, and apparently so productive a grain. Indeed, as it is there stated that this seed is already offered for sale, at $5 a bushel, it may be considered that this kind of wheat is already elevated in character to the dignity of a regular humbug; and as such, is launched on its voyage of experiment on the credulity of the agricultural public.

We happened to have known this kind of wheat, having witnessed its growth for two successive years, fully thirty years ago—and its subsequent abandonment, as worthless, by the cultivator. He was not sharp enough to think of such a scheme as offering for sale his last crop at $1 the quart; or perhaps he might have spread the kind through the United States as far as has been done with spring wheat—or as may yet be done with Egyptian wheat itself, notwithstanding this attempt to prevent that result.

The Egyptian wheat (as it was called) which we saw, and observed the after-product of, had several short heads standing out from the bottom of the principal and upright head, which grew as usual with other kinds; the stalk was of strength proportioned to bear so heavy a burthen of grain. According to the usual mode of calculating, in advance, the productiveness of such things, it was supposed that there must be a prodigious increase found in a wheat which bore on each stalk three or four small heads, in addition to one large one. In the earliest sowing, the usual care was taken of the small quantity of seed first obtained; and which care, of itself, serves generally to cause delusion, by showing a very large first product. This seed was drilled, very thin, (so as to make the most of the few seed;) in a garden, on a rich and excellent clay loam. It made two rows, several feet apart, and of some 20 yards in length. The plants were cultivated well, by the hand-hoe, and the growth and product, from so few seed, were considered remarkably fine. The first crop showed *generally* (if our memory is correct,) the valued peculiarities of the kind, in each stalk having several heads. The whole product was sown *broadcast* the next autumn, on a rich part of the field for wheat. The The next crop had none but *single heads*—and exhibited no superiority over the common wheat, so as to induce its being sown again.

The mere novelty of any culture, or, in other words, its being not yet fully tested by experiment, however exciting to curiosity and interest, is but a dubious claim to its being of more worth than other things better known, and already in general use. But even the character of novelty, of many of these humbugs, though forming their principal, if not sole claim to notice, is itself false; for instead of being *new*, they are *old* things which have been tried, and found wanting, long ago, and are again brought forward, because of the general ignorance of any former trial having been made. This applies to both the kinds of wheat spoken of above. Thus, since writing the last paragraph, we found in an old agricultural work, Duhamel's, an account of "Smyrna wheat," which is evidently the "Egyptian;" and making due allowance for the credulity and sanguine expectations of the experimenter, as to its rate of product, it does not differ materially from our own early and almost forgotten experience, as stated above. Having read the whole of this volume some twenty years ago, of course this account did not then escape notice; but it had been entirely forgotten. The volume was printed in 1762; and the experiments made, commenced in 1751. The passage is as follows:

"Smyrna wheat has a very large ear, with several less or collateral ears, growing out of, or round this large one. It requires a great deal more nourishment than the common husbandry will afford; for there its ears grows very little bigger, and produce little, if any, more grain than those of common wheat*. In all probability, it will do much better when cultivated according to the new method [i. e. of being sown in drills, and cultivated]: but the experiments which have hitherto come to our knowledge are very few. The following is the chief, and indeed the only one worth mentioning.

M. Le Vayer, one of the masters of the court of requests, sowed some of this wheat in 1751, in a small part of his estate at Duviere, in the province of Maine, and had a very good crop. He sowed it again in 1752, in the common way; and though it did not answer near so well this time, it yielded him a third more than common wheat would have done."

As to *spring wheat* in general, (which is so entirely new to nearly all who are believers in its superior value,) it is spoken of in numerous European works on agriculture; but by no such authority, that we have met with, is it deemed superior to winter wheat. It is valuable as a substitute, though admitted to be of less value, when the winter wheat has been killed, or could not be sown before winter; and especially in countries, like England, where wheat furnishes most of the bread of the population. Where a so much better spring grain can be raised as Indian corn, we doubt whether any ground remains for using spring wheat, even thus as a substitute. One of the main grounds of the value of ordinary wheat, is, that it can stand the cold of winter, and will produce the more heavily by remaining on the ground through the winter. Oats are not so hardy, and will not generally live through our winters; and therefore we are obliged to sow that grain in the spring. But it is well known, that when autumn-sown oats, *do* withstand the winter's cold, that the crop is far more abundant than any that could be obtained from the same land from spring sowing. It follows, that a kind of oats that could be safely sown in the fall, would be a very valuable acquisition. Winter wheat possesses that hardiness which would cause so much more productiveness in oats; and yet, many are willing to give up that quality, and expect greatly increased products from a wheat which is sown in the spring, because it is too feeble and tender to stand through the winter.

Some wheat of peculiar qualities was introduced from Chili about seventeen years ago, and became a subject of considerable interest to many: but it was found to be a *spring wheat*; and on that account was neglected by all who tried it. *Now*, according to the prevailing views, if again offered, it would be preferred for the very reason for which it was then rejected.

We have referred above generally to English opin-

*Count de la Galissoniere, says M. Duhamel, sowed some of it for several years: it produced a little more grain than common wheat; but the bread that was made of it, was not so good.

ions of spring wheat, and we have just looked for the received opinions of French agriculturists on the same subject. Rozier's '*Cours Complet d'Agriculture*,' &c., it may be presumed, presents a fair exposition of general opinion. In his article on wheat, there are but a few passages on this variety, which, however, show sufficiently that it was valued but little. A version of them will be here given.

"In 1784, I made the trial of sowing spring wheat *(blé de mars)* in autumn; it grew without beard. I have also sown autumn wheat in the month of March, and it became bearded. *May not then this spring wheat be but a degenerate product* (dégénérescence) *of the autumn wheat?* It is known that in 1709, all the wheat in France was entirely killed by freezing; and Louis XIV caused to be purchased in Egypt, wheat which arrived at Marseilles in the beginning of March. It was distributed throughout all the northern provinces of France, to re-sow the land in spring. Much was sown; it grew superbly, and it is from that time known as wheat of March." * * * * *

"Spring wheat has a yellow grain, very short and slender. It also is of two kinds; the one is bearded, the other not; which makes the straw of the latter preferable for food for cattle. This wheat also gives a bread that is too dry; it is necessary to mix rye with it to render it more sweet and palatable." * * *

"As to spring wheat, it is very valuable for lands exposed to the inundations of rivers, during winter, since that kind is not sown but in March."—It is evident that the author would have much preferred autumn wheat, if the peculiar disasters to which the lands were subject, did not render it impossible to sow in autumn with success.

The article of Rozier, quoted from, above, also refers, but in still fewer words, to our other *new-old* acquaintance, Egyptian wheat. This is described as a "yellow wheat, bearing many heads upon the same stalk;" and it is named the "miraculous wheat, or wheat of abundance," which designations are both admirably suited for a humbug; though not its character, as there given; which is, that it is "hard to thrash out, and its flour, very dry and rough, is not good alone, and must be mixed with rye."

We close with the opinions of the excellent practical farmers of Belgium, as to what spring wheat is to be valued for, and the contrary. Radcliffe's 'Report of the Agriculture of Flanders,' furnishes the following passage: .

"The heavy rains of the latter season, having made it impossible to sow the wheat till December, and the bad weather which succeeded having injured the clay soil considerably, the growing crop made but a poor appearance.

Upon the defective crops of wheat, the farmer in the month of March was sowing, and covering with the hand-hoe, the *triticum æstivum*, or spring wheat, by which means, notwithstanding the unfavorable weather, he expected to reap a full crop in August.

It seems an important advantage in this species of grain, that, though sown even so late as April, it will ripen at the same time with the winter wheat sown the preceding October. For which purpose, or as a crop in itself, when from bad weather, or any other interruption, the winter sowing has not been accomplished, the spring wheat is esteemed of great value, but is not considered to produce as much, or of as good quality, as the winter grain."

PLAN AND DESCRIPTION OF AN EXCELLENT GATE, AND A COULTER.

To the Editor of the Farmers' Register.

Essex, February 10th, 1838.

Dear Sir—Being always desirous of contributing something (even if it be no more in amount, than "the poor widow's mite,") towards the promotion of our good cause, and of your paper, which is constantly rendering such essential services to it, I now send you two drawings, which I confidently hope, will prove highly useful to our agricultural brethren, in every part of our country. The first drawing represents *a gate*, in the structure of which, I have endeavored to combine all the peculiar advantages that I have noticed in a great variety of gates, which I have carefully examined to ascertain which was best. The second drawing represents a single coulter; for the use of which the season is now rapidly advancing. I hasten, therefore, to send it to you, as I deem it far superior to any, out of five or six kinds of which I have made trial; and indeed, to all of which I have ever seen any description; for it unites strength, durability, cheapness, and simplicity in a greater degree than any of those; while its efficiency is equal to that of the best. All this I may safely say; for it is not my own invention.

But, before I proceed to my description, permit me to indulge my constitutional infirmity of *digressing*, by inditing you a brief homily, upon what I will take the liberty to call—*The Morals of Gates;* in humble imitation of the illustrous Franklin's "*Morals of Chess;*" a theme, by the way, not comparable, in importance, to mine; for *his* was nothing but a mere game contrived to kill time, whereas *mine* is an invention which has been of the greatest use in rural affairs from time immemorial.

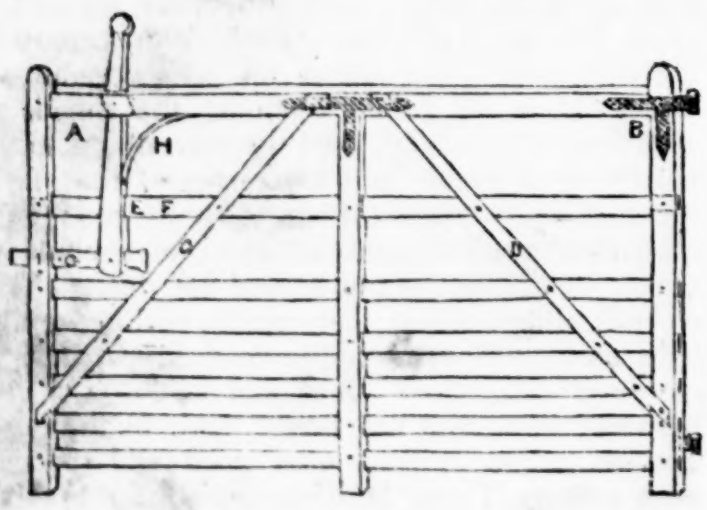
First then, considering the antiquity and universal utility of gates, the rarity of *good* and the frequency of *bad ones*, would hardly be credible, were it not for our daily experience of the fact; although all persons are aware of the numerous evils, that may arise from the latter cause. Among these, it is not one of the least, that even *our characters* often suffer from it, with strangers; for whenever they pass a bad gate, no remark is more frequently made by them than—"*this must be a bad, careless farmer—a lazy, slovenly fellow.*" On the contrary, the sight of a good gate inspires them, at once, with a belief that the owner is a good manager, although, possibly *that* may be the only good thing about his whole establishment. Here the gain is obvious; the means of attaining it so cheap, and the advantage to the proprietor so great, in other respects, that he is inexcusable to neglect them. Again, good gates contribute much to preserve good understanding among neighbors, by preventing the depredations of each other's stock; than which, nothing, in the long catalogue of neighborhood grievances, is more apt to produce bitter and lasting quarrels between those who are bound, both by duty and interest, to live in peace and good will towards each other. Those quarrels are almost inevita-

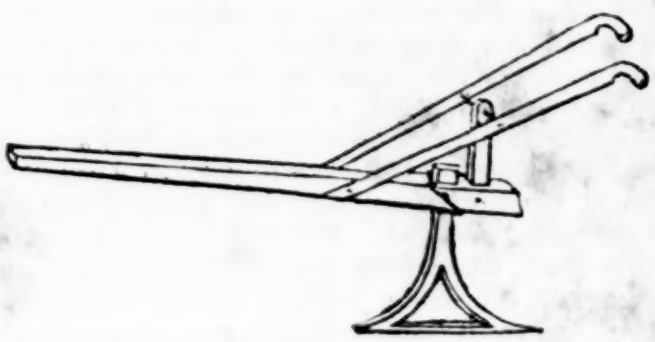
ble; for the *injurers* and the *injured* rarely ever measure their losses by the same standard, or take the same views of their provocation. Hence, the wrathful indignation becomes mutual—virulent abuse is often reciprocated; until, at last, by such alternate aggravations, this most ridiculous neighbor warfare—originating in no better cause, than a bad gate! is waged with quite as much animosity, as ever inspired two nations to attempt each others' destruction. Let a short recital of one such quarrel, of which I have known several, not materially different, suffice for the rest; and let us suppose, that, on a certain occasion, A's hogs, both seniors and juniors, finding B's gate most invitingly out of order, did, incontinently make a forcible entry through the same, into B's cornfield; and not having the fear, either of God or man, before their eyes, did there most felonously break down, and wantonly destroy sundry ears of corn, to the great detriment of the proprietor; whereupon, the said B, forthwith issues his mandate to his overseer and negroes, (nothing loth,) to dog, shoot, or otherwise destroy the said marauding porkers. A report of the killed and wounded is speedily made to A, by his people also; made too, with a thousand embellishments and aggravating circumstances, to screen themselves from blame. Then comes A's mandate, as a retaliatory measure, to murder B's dogs; or should *they* not be "come-at-able," to wreak the vengeance, at the first opportunity, upon B's famous high-bred bull, with some great appropriate name, such as Bonaparte, or Jackson. This order being executed, imparts such additional dignity to the quarrel, that it not unfrequently descends to the children, as a valuable part of the family inheritance; and thus may whole families, to the second generation, be kept at variance, for many years—all owing, in the first instance, to a *bad gate!!*

The foregoing arguments and suggestions in favor of good gates, ought, alone to cause every body to make them, who use them at all. But they are susceptible of more important application. They may teach *even politicians*, (high as they generally hold their wise heads above all agricultural matters,) a most useful lesson, thus. When they notice, *as they might*, their perfect adaptation to all the purposes for which they were designed, and plainly perceive that these purposes could not properly be accomplished, unless all their bars and bolts, and braces—their tenons, mortices, dovetails, and hinges—were carefully maintained in their original and relative combinations and positions; might not the said wise-headed politicians apply these manifest facts to our state and federal constitutions? Compared to *a gate*—they are machines of vastly greater importance and complication; although the arguments to prove the necessity of maintaining the relative position of all the different parts of *the gate*, are precisely the same, as serve to demonstrate a like necessity to maintain, unimpaired, the relation of all the parts of our political constitutions; if, indeed, we sincerely desire to preserve them. *Good gates, carefully kept up*, according to the plan of the contrivers, greatly contribute to the neighborly amity, and all its delightful accompaniments of good offices. But *their* sphere of influence is limited to the walks of private life; whereas, *good political constitutions, carefully maintained*, secure peace, prosperity, and happiness, to millions upon millions of human beings, who, *without such restraint*, would have a chance, not much better than that of so many tygers and hyænas, of living together in peace and harmony. If, therefore, any considerations or arguments can possibly be drawn from the former, in favor of the latter, I hope to be excused for making the attempt; especially, when the worst that can happen, will be to condemn *me* as somewhat too fanciful in forcing my premises and conclusions to suit each other.

There is a little story related by Mr. Say, in his excellent work on political economy, so applicable to this subject of *bad gates*, that I cannot forbear to repeat it, in his own words.

"I remember" (says Mr. Say,) "being once in the country, a witness of the numberless minute losses, that neglectful housekeeping entails. For want of a trumpery latch, the gate of the poultry yard was forever open; there being no means of closing it externally, it was on the swing every time a person went out; and many of the poultry were lost in consequence. One day a fine young porker made his escape into the woods, and the whole family, gardener, cook, milk-maid, &c., presently turned out in quest of the fugitive. The gardener was the first to discover the object of pursuit, and, in leaping a ditch to cut off his further escape, got a sprain that confined him to his bed, for the next fortnight; the cook found the linen burnt, that she had left hung up before the fire to dry; and the milk-maid, having forgotten, in her haste to tie up the cattle properly in the cow-house, one of the loose cows had broken the leg of a colt that happened to be kept in the same shed. The linen burnt, and the gardener's work lost, were worth full twenty crowns; and the colt about as much more—so that here was a loss, in a few minutes of forty crowns—purely for the want of a *latch*, that might have cost a few *sous*, at the utmost; and *this* in a household where the strictest





economy was necessary--to say nothing of the suffering of the poor man, or the anxiety and other troublesome incidents. The misfortune was, to be sure, not very serious, nor the loss very heavy; yet, when it is considered, that similar neglect was the occasion of repeated disasters of the same kind, and ultimately of the ruin of a worthy family, it was deserving of *some little* attention." Thus endeth my homily, and now for my descriptions.

The first drawing represents a gate nine feet wide from out to out, by five feet high. The hinder upright or stem is four inches by three. The centre and front stem, are three by two and a half inches. All the bars are three inches wide; but the upper one is square behind, tapered to two and a half inches before. The other bars are one inch thick, at the hinder ends, tapered to five-eighths at the front ends. Each tenon has a shoulder three-fourths of an inch deep; but the shoulders behind should be cut in the *lower* edge of the bars, and those before, in the *upper* edge, as indicated by the dotted lines across the front and hinder stems, where the tenons of the bar, next the top, enter them. These shoulders, thus cut, aid, both before and behind, in counteracting the tendency to *swag*; which is common to *all* gates. This tendency, if not checked, always makes the angle A *greater*, and the angle B *less* than a right angle. The brace C, therefore, acts as a *tie*, while the brace D, acts as a *stretcher*, and both co-operate with the shoulders of the tenons, at the ends of the bars, still farther to counteract the swagging. But the most effectual counteraction of the whole is the upper hinge, which is alike on both sides the gate, and which will suffice of itself, unless the half inch iron bolts, that fasten together by screws and nuts the opposite sides of this hinge, or the hinge itself, should break, which it cannot easily do, if made two inches wide and a quarter of an inch thick. A gate thus guarded cannot possibly swag, while the various guards, eighteen in number, maintain their relative positions. The shank of the lower hinge, should be made an inch or two longer than that of the upper hinge, and the hook on which it hangs should be driven in the post at the same distance beyond the perpendicular line from the upper hook. This fixture, when the gate is opened, throws the lower end of the hinder stem farther from the face of the post, than the upper, and consequently, the gate will shut of itself, if no obstacle interposes. By this simple contrivance the posts may be fixed perpendicularly; otherwise they must incline considerably *inward*, according to the common very unsightly practice. This lower hinge should be about one inch square next the shank, tapered to five-eighths at the inner end, which should have a screw and nut to fasten it. The iron in the form of a T, which fastens the centre stem, the upper bar, and the upper ends of the braces together, by half an inch iron bolts, has a corresponding iron on the opposite side of the gate, and aid in making "assurance doubly sure" against swagging.

The handle of of the latch is two inches wide by five-eigths thick, where it passes through the upper bar; and three by two and a half inches, at the lower end, through which the hinder end of the latch passes, and is fastened in a mortice, somewhat longer and wider than itself, by a wooden pin, smaller than the hole in that end of the latch through which the said pin passes. This is necessary to give it play, and the same difference, for the same purpose, must be made between the size of the hole through the upper end of the handle, and wooden pin which fastens it in the upper bar of the gate. Another mortice is cut through the handle of the latch, at E; also, somewhat longer and wider than the bar on which it plays, and a pin must be fixed in this bar at F, to prevent the latch from being drawn out of its mortice in the front stem, unless the mortice through the upper bar be cut exactly in the oblique direction indicated by the dotted lines across that bar. If this mortice be not thus cut, another wooden pin, in the latch itself will be necessary at G, to prevent it from being forced too far forward, by the spring H. This may be made of the thinnest hoop iron, if not bent beyond its point of elasticity; but steel is best. To relieve the latch from friction against the bottom of the mortice through the front stem, a round wooden pin marked I, is driven in, so that half of its thickness shows above the bottom of the mortice, and supports the lower edge of the latch, which should be rounded for three inches, at this part, and then the two surfaces would touch only at a single point.

The foregoing description, may perhaps appear, to some, unnecessarily minute; but, I myself, have so often been puzzled by two much brevity in such matters, that I was determined to err, if at all, on the safe side. In the gate here described I claim nothing as my own invention, but the latch and the upper hinge, which last I have not used, although previous use is not necessary to establish its value.

A very brief description will suffice for the coulter, the original contriver of which, I do not know; for I met with it about two years ago, on board the Rappahannock steam boat, in possession of a gentleman who could give me no other account of it, than that he procured it from the late Mr. George Banks of Stafford county. I was so struck with its manifest superiority to any coulter I had seen before, that I immediately made a sketch of it; had one made as soon as I could; and have been using them ever since, with a decided preference to all others. None, of which I have any knowledge, are superior to it, in any one respect, while this is superior to them all in two important particulars; you may wear out both points, by reversing them, before you send it to the blacksmith; and the point which works behind, causes the coulter to run much more steadily. A single horse will draw it easily in most of our lands, after they have been well broken up with the plough; while four, even of our miserable half-starved Virginia oxen, will break or tear up roots by it, as thick as a man's wrist, with no more "geeing" and "hawing" than they require to drag a load of wood to their master's door, or to any other coulter, that I have ever seen tried.

The lower part of the coulter is made out of inch-square iron, flattened and well steeled at the points, and is twenty-two inches long. The upright part is of bar-iron two and a half or three inches wide, by a half inch or five-eighhts thick, and should be seventeen or eighteen inches high from top to bottom, and left square both on the front and hinder edge. A half inch bolt will suf-

fice to fasten it in the mortice through the beam, which should be at least four by three inches at that part. A band of round, half-inch iron, should also be fixed on that part of the beam, so as to rest against the front edge of the coulter above and its back edge below, which will keep it firmly fixed in the mortice.

If these two drawing, with my description of them, should contribute only half as much as I hope they will, to the benefit of our agricultural brethren, it will be deemed an ample reward, to the end of life by their friend and yours,

JAMES M. GARNETT.

To the Editor of the Farmers' Register.

BUCK-WHEAT CAKES.

By the way of contributing a little to the usefulness of the 'Register,' I will venture to send you a receipt for making buck-wheat cakes. In the room of water, mix up your batter with buttermilk; instead of leaven, yeast, or yeast powder, use a little saleratus, and one, two, or three eggs. If you do not pronounce it the best buck-wheat cake you ever eat, you and I do not agree in taste.

The same receipt is likewise as good for other batter cakes and biscuit. The theory of this is plain, which you will at once see. R.

MARLING AND LIMING IN NEW JERSEY.

To the Editor of the Farmers' Register.

Cumberland, N. J., March 8th, 1838.

Sir—I became acquainted with your 'Essay on Calcareous Manures,' between two and three years ago, by the way of an article in the 'New Jersey State Gazette', copied from the 'New York Journal of Commerce.' I was so well pleased with your theory, as there laid down, that I procured a copy of the essay of Messrs. Carey & Hart of Philadelphia, the first opportunity I had; and I can truly say I perused it with much pleasure, and I trust with some profit. I consider it a valuable work, especially for those making use of marl and lime. I put your 'Essay' into the 'Union Library,' thinking to procure one for myself. I have sent to Philadelphia several times, but could not obtain one at any price. It is perhaps not more than two years since people in these parts generally became in favor of marling and liming. Having got clear of their prejudices, many are perhaps acting in the other extreme. Many people in this county cart marl that contains only thirty or forty per cent of calcareous earth, 6, 7 and 8 miles, and pay for it at the pits from 50 to 65 cents for a load of 20 bushels.

Our practice in this part of the country, generally, is to raise from one to three crops of buckwheat, first, before we sow clover, or try to raise some other grain.

I sowed gypsum last summer on buckwheat, from one to two bushels to the acre. The season was quite wet, and I could perceive but little difference; and none between that which had but one, and that which had two bushels to the acre.

I would like to be informed in the 'Register' or some other way, of your success in using plaster; and whether you still continue to hold to your theory respecting its want of action, as laid down in your essay. I think your theory very ingenious, and far more reasonable and scientific than the old theory respecting the influence of salt water, heretofore maintained by many, without foundation.

Respectfully

CHARLES F. RANDOLPH.

[In answer to the inquiry above, we have to say that there has been nothing found, either in later experience or information, to contradict or oppose the views presented in the 'Essay on Calcareous Manures,' as to the action of gypsum on marled lands; and as to the fact, and the cause, of its not acting on all soils which most need the application of marl or lime.—ED. FAR. REG.]

From the Norfolk Herald.

DISASTERS ON RAILWAYS.

A correspondent calls our attention to a communication in the March number of the Farmers' Register, purporting to be from a correspondent on the Eastern Shore of Maryland, but suspected to have originated nearer home, in which the writer, while arguing against the construction of the Eastern Shore rail road, does injustice, we think, to Major Kearney. But what we regard as more particularly deserving our attention, and the expression of our regret at such remarks from such a quarter, are the notes by the editor of the Register, whose position towards the great body of the public, if we understand it rightly, is one of strict neutrality in regard to all questions of a local bearing. Whatever interest he may feel individually in the line of rail road from the Roanoke to Fredericksburg (and it is natural that he should feel a deep interest in it) it does not become him to make his excellent Register, which owns the whole state for the sphere of its usefulness, a vehicle for advancing one section of it at the expense of another. For instance: he says, "but if experience may be relied on to furnish evidence, it may be safely assumed, that a well managed railway is the safest mode of travelling next to well managed river (*not Atlantic or Chesapeake*) steam vessels." Now this is an assumption notoriously contradicted by fact. Without instituting a comparison between the safety of rail road and steam boat travelling, or between that of *river* steam boats (including those on the western waters) and the steam boats navigating the Chesapeake between Norfolk and Baltimore for the last 21 years, we will only state the remarkable fact, that while the public sensibility has been almost incessantly pained by recitals of "dreadful steam boat disasters" on our rivers, and "accidents and loss of life on rail roads," from all parts of the country, no accident has ever occurred on board of one of the boats running on the Chesapeake, which involved the loss of a single life, or any bodily injury whatever, from their commencement in 1817 up to the present time. Now we defy the editor of the Register, and the whole world to back him, to produce a corresponding instance of exemption from casualty and human suffering on any other line of travel, in so long a period of time. The fact here stated is too well known to travellers, for the inuendo of the Register to cause the least apprehension for their safety in committing themselves to the Chesapeake steam boats.

The editor of the Register also takes occasion in his remarks, to notice the disasters on the Ports

mouth and Roanoke rail road, during the last year, in contrast with the great security which has attended the operations of the Petersburg road, which he dwells upon *con amore;* but he says not a word about the recent one on the Richmond and Fredericksburg road. We can state for his information, and that of the public, that the directors of the Portsmouth road have profited by the disasters to which he alludes, so far at least, as to place it in a condition for safety and expedition, not inferior to that which he vaunts of the Petersburg road, and certainly equal to that of the Richmond and Fredericksburg.

The growing popularity of the Chesapeake route, however, cannot be checked by any device, while travellers prefer, as they always do, steam boats to steam cars; for when they have to choose between two routes, the one entirely by rail way, and the other for two thirds of the distance by steam boat, they will assuredly incline to the latter.—[ED. HERALD.]

When it is proposed to reply to, and still more so when to condemn any publication, it is proper, both for fair dealing to the writer, and for the better understanding by the readers of the strictures, that the piece censured, itself, should be presented at the same time. This course we have always desired to pursue, as is done in the present case; and we have never availed ourselves of the customary privilege assumed by editors, of answering an offensive or disagreeable article, before, or without, copying the article itself; and thus, in advance, raising prejudice against it in the minds of readers. We regret that our highly respected brother editor should have adopted a different course; and have done us injury in both these respects, by the foregoing editorial remarks, of his paper of March 30th; and which course is the less excusable, as the entire note, which he considered so reprehensible, is but little, if any, more than half the length of his remarks copied above. Of course, the length did not forbid its insertion. As a matter of sheer justice, we request that he will supply the omission to his many readers who do not see the Farmers' Register, by copying the foot-note in question, from page 752 of the March No., and also, that he will accompany it by these remarks, which his have rendered necessary. They will be made as concise as possible.

First—in correction of mistaken impressions. The *suspicion* that the correspondent who opposed the Eastern Shore Rail Road is not what his communication purports, is as much unfounded, as the expression was uncalled for, in argument, or in courtesy. The writer is a resident landholder and cultivator of the Eastern Shore of Maryland, and one whose private interest in the prosperity of that region, as well as his standing and general intelligence, give him a right to express opinions on that subject, even though they should be mistaken. That his views do not agree exactly with ours, is sufficiently evident to the readers of the notes to his piece, and of several other articles of greater length, which have before appeared in this journal. In reasoning on general and public facts, the name of the writer is not required as authority; and there is no reason why such pieces should not be anonymous. But we assure our brother editor, that we would not knowingly permit a correspondent, were one to attempt such a deception, to *assume false colors*, to sustain private interests either opposed to those which would be inferred from his assumed locality or position, or with which he was desirous to conceal his connexion.

In the next place—we claim for this journal, and its editorial conduct, to the fullest extent, the ground which, it is justly said above, ought to be occupied; but which, it is charged, has been abandoned in the note referred to. In the five volumes of the Farmers' Register, there have been many articles relating to the rail roads from Petersburg, and from Portsmouth, to the Roanoke; and while these two great improvements stood as rival claimants, contending before the legislature, we confess it was difficult, in a journal like ours, open to both sides, and designed to favor the general cause of internal improvement, to appear so perfectly neutral as to satisfy all persons of both the rival interests. But until now, no complaint has ever reached us of having shown less than equal favor and justice to the Norfolk and Portsmouth road and interest; though we have heard of charges of the opposite character, being made by some of our nearer neighbors. These charges had no just foundation; but there is no question, but that more selections, communications, and editorial notices, have appeared in this journal, favorable to the Portsmouth route, and its designed continuations, southern and northern, than to the Petersburg route. The pages and indexes of our volumes offer ready proofs of what is here stated in general.

The views of our correspondent from Maryland, if received as correct, would have operated to lower the true estimation of the safety and convenience of rail road travelling in general, and of the value of the Eastern Shore Rail Road in particular, which route has been planned solely as a most important extension of the Portsmouth and Roanoke Road, and is expected, by the friends of the latter, to give it double value. Now, the manifest object and purport of our note was to defend what was impugned, the safety of rail road travelling; and in that defence, we conceive that Norfolk has at least as deep an interest as Petersburg, and that we were thereby upholding the general interests of the one, fully as much as those of the other.

But we limited our assertion of almost entire security to passengers, to "well-managed railroads." Would our brother editor, or our Norfolk friends, have desired that the claim should have been extended to, and made to include the

ill-managed also? Such a claim would have been as impolitic in argument, as it would have been manifestly false in point of fact. The editor of the Herald does not even dissent, in the slightest degree, from our assertion that the accidents on the Portsmouth road, so fatal in their effects on passengers, were caused by gross mismanagement, and were *not* such as are "necessarily and unavoidably attendant on railway travelling." By maintaining that the causes of these disasters were *not* permanent and continuing, but temporary, avoidable, and that in fact, they *had already ceased to operate on that road*, and that the proper and safe course of management had been there adopted, surely we were *sustaining* instead of *detracting from* the present and future value of the Portsmouth and Roanoke railway.

But the odious part of this branch of our remarks was presenting the case of the Petersburg railway, as proving incontestibly, by long experience, the entire safety of travelling on railways, under proper regulation. This road was not selected for illustration because it is (or is considered as) a rival work to that of Portsmouth, but because we happened to know the facts. Any other road, presenting as strong, or stronger, and as well established facts, would have been as readily noticed. And should any highly improper and dangerous measure be hereafter be adopted on this road, we shall be as ready to denounce it, in advance of the occurrence of its expected ill effects, as to commend what has been heretofore, and is, worthy of commendation. If such reprehension should be necessary, and be ever so sharply given, we shall deem it as *friendly*, instead of *hostile*, to the interest of rail-roads in general, and even of the very road whose conduct is then condemned.

Our little note is not only censured for its sins of commission, but also of omission, in not speaking of a recent accident on the Richmond and Fredericksburg railway. It was not seen then, nor is it now, what bearing that accident, or any other circumstances of that road, had on our designed defence of the safety of railway travelling in general. We know nothing of that road, except from the newspapers, and are not prepared to say whether it furnishes most examples of good, or of bad management. But since we are thus twitted with the omission of instances of the latter, we will add, that if its conduct had been ten times worse than any charged, and the accidents to the trains ten times more numerous than they have actually been, it would only serve to strengthen our previous argument against placing the burden cars *behind* instead of *before* the passengers. For we understand, that by simply avoiding that very faulty arrangement, that all the accidents on that road have been entirely harmless to the lives and limbs of the numerous passengers.

The only remaining charge against our note, is its admitting "well-managed *river* steam vessels" to be possibly safer than even well-managed railway passenger cars; and the denying that greater degree of safety to Atlantic or Chesapeake steam navigation. The former part of the admission, whether correct or not, certainly is not obnoxious to the suspicion of local or private interest. We had especially in view the James River steamers, in which Norfolk is very deeply interested, and Petersburg, scarcely at all. But without claiming the benefit of the limitation to James River, we think that truth demands the admission, and all experience proves, that "*well-managed*" river steamboats are as safe a mode of conveyance as any in this country; and that the numerous and fatal disasters of the *badly-managed*, on the western rivers and elsewhere, afford no ground of contradiction. As to the denial of equal safety to sea steamers, it is enough to refer to the horrible fate of the steamer Home. For the Chesapeake steamers, we readily admit that no loss of life has yet occurred, and have no ground to deny that they are as well constructed, and as well navigated, as any could be. But every bay as well as sea vessel is liable (however small the chance, and remote the danger,) to destructien by water or fire, and steamers particularly to the latter most awful calamity; and if the vessel were about to sink, at only ten miles from shore, having on board, as is usual, twice or thrice, and it might be five times as many passengers as could be crowded into the few boats, the almost certain result would be the swamping of the boats, and the death of almost every passenger. Such a disaster may not occur in a century; perhaps never; but the possibility of its occurring, and the almost certainly fatal results of such an occurrence, must always put Chesapeake, as well as Atlantic steamers, on a very different footing of security from that of the James River steamers.

In concluding, we beg leave to assure the editor of the Herald, that we are not only free from every wish and feeling inimical to Norfolk and Portsmouth, and their interests, but that we should rejoice to see their noble seaport rapidly rising to the elevated station in commerce, population and wealth, for which, by its highly favorable location, and great natural advantages, it seems to have been designed.—ED. FAR. REG.

THE PERSIMMON TREE AND THE BEER DANCE.

(Continued from page 596, vol. 5.)

To the Editor of the Farmers' Register.

When I found my "Persimmon Tree," grouped with the "Persimmon Tree" of James M. Garnett, Esq. in your January No. of the Far-

mers' Register, I drank his health in a glass of persimmon beer. I am not only pleased with his remarks, but highly gratified that the gentleman has employed his able pen on the subject of this valuable tree. I find very little difference between his opinions and mine, and it rarely happens that two communications on the same subject, accidentally falling together, should correspond in so many particulars. We agree perfectly, as it regards the use and value of the persimmon tree. It will be seen, however, by the reader, that he has discovered an astringent acid quality, in the leaves and unripe fruit, which, when combined with iron, gives a black color for ink. To make amends for this, I have given the medicinal properties of the bark. He has discovered vinegar for table use; to meet this, I have given a good receipt for making beer. He has also informed us, that the wood of this tree makes shoe-lasts; and I have told you, the wood of the persimmon tree makes bed-posts. His molasses and sugar stand ready to sweeten my coffee and tea, and the two communications are so nicely poised and equally balanced, that it is impossible to tell which will kick the beam. I regret, however, that the learned gentleman has obtained brandy by the distillation of persimmon beer; for it may have a very demoralizing effect in eastern Virginia; the brandy drinkers will require such a demand on the product of this tree next fall and winter, that we may lose our sugar, molasses, pies and puddings. Should this be the case, there will, I suspect, be a tumultuous scuffle, and all make a simultaneous movement in order to obtain the great prize. Then, as Jim Black would say, "*the longest pole takes the simmons.*" I am of the opinion, that persimmon beer contains no alcohol, and although it is found in most fermented fluids, I have never witnessed any intoxicating effects from the use of this beverage. Our slaves make it in great perfection, and use it freely without any appearance of inebriation. An old servant in my family was remarkable for making good persimmon beer, and whenever I would pass the door of his house, he never failed to invite me in to taste his beer. "Come, master, drink some beer; simmon beer and ash-cake is equal to *cash*; but it don't make *glad* come like whiskey." Although the old man was a moveable swill-tub as long as his beer lasted, yet I never knew him to be intoxicated. I differ with Mr. Garnett, as it regards the presence of alcohol in ripe fruit. Speaking of the persimmon, he says, "it contains so much of the alcoholic principle as never to freeze." I have been educated to believe, that alcohol is never present in ripe fruit; its components, oxygen, hydrogen and carbon, are not developed or properly evolved, previous to fermentation. Alcohol forms the true characteristic of vinous liquors, and is obtained from wine and other fermented fluids by distillation.

I will call your attention again to the persimmon seed, as a substitute for coffee. It has not the genuine coffee taste, and some individuals may not like it at first; but if they will continue its use, with one-third or one-fourth West-India coffee, they must be pleased with it, and but few can distinguish the taste from genuine coffee. Much depends on parching the seed; they should be carefully stirred with a stick while parching, in order to prevent them from burning, which never fails to give the coffee a bitter taste. Twelve gallons of water, to eight gallons of persimmons, makes the beer luscious, rich and very fine; it may be too brisk and sharp for delicate palates; the beer we generally meet with, has double the quantity of water. Although I am of the opinion that persimmon beer is not intoxicating, yet I have witnessed great glee, and highly pleasurable sensation, produced in our slaves, over a jug-gourd of beer; but I ascribe this reverie or pleasurable hilarity, to the wild notes of the "banjor," which give zest to the beer. There is an indescribable something in the tones of this rude instrument, that strikes the most delicate and refined ear with pleasing emotion; the uninterrupted twang or vibration of its strings, produces a sound as it dies away, that borders on the sublime. I never could account for its wonderful effect on a well-organized ear, capable of distinguishing and appreciating agreeable sounds; unless it be admitted, that concord and discord are so completely blended as to produce perfect harmony. This opinion, however absurd it may seem at first view, is not without its supporters. Pope says, "all discord is harmony not understood."

The honorable gentleman, Mr. Garnett, has indulged in a little innocent merriment in giving us a "Munchausen story"—a "mutton machine," which would really be invaluable if reduced to practice. With all due respect for your valuable columns, I must ask the privilege of being indulged in a similar strain, in giving an account of a "beer dance" that came under my observation.

Some years ago, I rode in the night to visit a patient, and as I passed the house of Mr. Samuel Poe, in the lower end of Prince Edward, I heard the tones of a banjor, and was told by the old gentleman, (Mr. Poe,) that his servants had brewed a barrel of persimmon beer, and he gave them the privilege of having what they called a "beer dance." Curiosity induced me to ride to the door, accompanied by Mr. Poe, and the other gentlemen. And here we saw rare sport! "an unco sight!" Not, however, such a sight as Tam O'Shanter saw when he peeped into "Kirk-Alloway," for the dancers there were "*warlocks* and witches;" here they were Virginia slaves, dancing jigs and clapping "juber," over a barrel of persimmon beer. It occurred to me, that if Tam could have made his appearance about this time on his gray mare *Meg*, the scene would have frightened *Maggie* more than the "*bleeze*" of "Kirk-Alloway;" and Tam might have roared out, "weel done Cutty Sark!" a thousand times, and the torch-lights would not have been extinguished.

The ball was opened with great ceremony by singing a song known to our Virginia slaves by the name of "who-zen-John, who-za."

"Old black bull come down de hollow,
He shake hi' tail, you hear him bellow;
When he bellow he jar de river,
He paw de yearth, he make it quiver.
Who-zen-John, who-za."

This was a sky-rocket thrown out, as a prelude to the grand exhibition, and will give the reader some idea of what is to follow. Those who could not get seats in the house, took their stand outside, peeping in the door and through the logs, making remarks on the dancers; and here I will observe, that there was a complete Babel jargon, a confusion of tongues!

"Down the road, come show me de motion." "Set to your partner, Dolly."—"Cut him out, Gabe."—"Sal, *does* put her foot good."—"Yonder come de coal-black horse."—"The yallow roan's up! hear how he lumbers! he's a *rael* stormer, ring-clipper, snow-belcher and *drag out*."—"Congo is a *scrouger*; he's up a gum, and no bug-eater I tell you; he carries a broad row, weeds out every thing—hoes de corn, and digs de taters."—"Molly look like kildee; she move like handsaw—see how she shake herself."—"Hello! in there, I wish you all sen' us out some simmon beer." "Lor! *see* how Aggy shake her foot! she *ken* pull the whip-saw down."—"Nick? come here and see Ben cross hi' bow-legs! look at hi' mouf! when he grin, hi' mouf and teeth like hen-ness full o' eggs."—"Nick? I reckon if Tamar's cat stay in there much longer, they will mash her guts out; her skin *'ont* hold peas."—"Come here, Gabe; come, if you please; Jackson's Dick is dancing with Ellington's Nance! see how she quivers! *Now*, Nance!—*Try*, Nance!—She *does* but look pretty.—When she sets and turns, she is like a *picter* —and she is fine form, back. Dick shan't have Nance; I'll kick him high as the meat house first." [Sings.] "She *bin* to the north, she *bin* to the south, she *bin* to the east, she *bin* to the west, she *bin* so far *beyond* the sun, and she is the *gal* for me."—"Dick had'nt no business dancing with Nance; he ain't a man of *gumption*. I tried him, and he can't be made to understand the *duramatical* part of the function, the function of the fundamental, and the *imperality* of ditrimental things. Gabe? Dick's a fool, and you may tell him Sambo says so: he is knock-knee'd, and ugly enough to eat *Gumbo*." "Well, I know that; sing on Sambo."

"I went from the great-house, down to the kitchen,
To get a knot of light-wood to see to go fishing,
To treat granny Dinah;

I went to the stable, I cotch master gray horse,
I clap the saddle *pon* him and he trot like *do'nk* care.
He *do'nk* care, he *do'nk* care.

Having become tired of this out of door conversation, we concluded to view the group in the house. Here the banjor-man, was seated on the beer barrel, in an old chair. A long white cow-tail, queued with red ribbon, ornamented his head, and hung gracefully down his back; over this he wore a three-cocked hat, decorated with peacock feathers, a rose cockade, a bunch of ripe persimmons, and to cap the climax, three pods of red pepper as a top-knot. *Tumming* his banjor, grinning with ludicrous gesticulations and playing off his wild notes to the company. Before him stood two athletic blacks, with open mouth and pearl white teeth, clapping *Juber* to the notes of the banjor; the fourth black man held in his right hand a jug gourd of persimmon beer, and in his left, a dipper or water-gourd, to serve the company; while two black women were employed in filling the fire-place, six feet square, with larded persimmon dough. The rest of the company, male and female, were dancers, except a little squat wench, who held the torch light. I had never seen Juber clapped to the banjor before, and you may suppose I looked upon such a novel scene, with some degree of surprise. Indeed I contemplated the dancing group, with sensations of wonder and astonishment! The clappers rested the right foot on the heel, and its clap on the floor was in perfect unison with the notes of the banjor, and palms of the hands on the corresponding extremities; while the dancers were all jigging it away in the merriest possible gaiety of heart, having the most ludricuous twists, wry jerks, and flexile contortions of the body and limbs, that human imagination can divine.

"The whole world is a ball we find,
The water dances to the wind;
The sea itself, at night and noon,
Rises and dances to the moon.

The earth and planets round the sun,
Still dance; nor will their dance be done,
Till nature in one blast is blended;
Then may we say the ball is ended."

The rude ballad set to Juber, corresponds admirably with the music and actors in this wild fantastic dance. While the clappers were laboring in the performance of their office, they responded at the same to the notes of the banjor.

"Juber up and Juber down,
Juber all around de town,
Juber dis, and Juber dat,
And Juber roun' the simmon vat.
Hoe corn, hill tobacco,
Get over double trouble, Juber boys, Juber.

Uncle Phil, he went to mill,
He suck de sow, he starve de pig,
Eat the *simmon*, gi' me de seed,
I told him, I was not in need.
Hoe corn! hill tobacco!
Get over double trouble, Juber boys, Juber.

Aunt Kate? look on the high shelf,
Take down the husky dump'in,
I'll eat it wi' my *simmon* cake,
To cure the rotten belly-ach.
Hoe corn! hill tobacco!
Get over double trouble, Juber boy Juber.

Raccoon went to *simmon* town,
To choose the rotten from de soun,
Dare he *sot* upon a sill,
Eating of a whip-poor-will.
Hoe corn! hill tobaccco!
Get over double trouble, Juber boys Juber."

When supper was announced, the banjor-man, was first served; then the clappers and beer bearer, and lastly, the beaux and their partners. Each had a huge loaf of larded persimmon bread with a gourd of beer.

Thus ended the beer dance, and as I left the house, I thought to myself, that Virginia slaves, were the happiest of the human race—and I still think so.

"The learn'd is happy, nature to explore,
The fool is happy that he knows no more."

Solomon the wisest man, says—"in much wisdom, there is much grief: and he that increaseth knowledge, increaseth sorrow."

The beer dance, I have attempted to describe, is a faint representation of what actually occurred. It requires an abler pen to it justice; I feel mortified that I cannot give a more vivid and glowing des-

cription of these black beaux, who acted so conspicuous a part with their partners in the persimmon junket. The broad grin, the smile of the little squat wench, seen through her torch-light, the humid lip, the twist of the tongue, the white teeth, the oblique look, the glance of the eye, the toss of the head, the quaint bow, the curved shin, the bandy leg, the nimble jig, the affected air of the wenches, the profuse perspiration, the cloud of dust, the lurid room, the phiz of the banjor man, the banjor's *tum, tum, tum,* and Juber's song and clap, would call forth the combined talents and lively imagination of a Wirt, an Irving, a Burns, an Addison, and Dryden. And if a northern abolitionist, with his pocket filled with inflammatory documents and resolutions, could have witnessed such a scene in Virginia, he would, in my opinion, have consigned them to the flames;,his great love for the blacks, to the contrary notwithstanding.

In conclusion, I offer no apology for introducing in your columns, and bringing before your intelligent readers, such a novel, rude production, as the *beer dance.* We are to derive from such scenes in this life, much useful instruction; the poet, divine, statesman, philosopher, and all mankind, may be benefited by looking *down* in life, in order to explore the dark corners of nature.

There is this consolation to be derived from the scene I have described; the pleasing recollection that God has placed us high in the scale of human beings; and we should all appreciate its worth.

I drink you the following sentiment, in a glass of persimmon ale: May the product of the persimmon tree, substitute foreign wines, molasses, sugar, tea, and coffee, and save the "old dominion" thousands annually.

With sentiments of regard, and esteem, I am,
Your obedient servant.
WILLIAM B. SMITH.

REMARKS ON THE PUBLICATION OF 'JOHNSTONE'S TREATISE ON DRAINING, EMBANKMENTS, &c.'

In this number is completed the general 'Treatise on Draining, Embanking, &c.' It was contrary to our intention and desire that this republication should be divided between two of our volumes. Nevertheless, the subject treated in each volume is entirely distinct and independent of the other; the one being on draining in all its branches, and the portion here presented embracing all that relates to embanking low lands straightening water-courses, and constructing dams, &c. This latter portion is valuable not only in a very important degree for agricultural improvement and profit, but even more, at least in this country, and in these times, to civil engineers, and to all other persons who, without the knowledge possessed by engineers, undertake the construction of dams, making canals, straightening of rivers, and other such works. In the *improvements* (so often miscalled,) of rivers for navigation, in this country, millions of dollars might have been saved, if merely the theoretical principles, and practice, presented in this number had been known, and properly regarded, by the constructors.

The republication of this work, in the Farmers' Register, besides causing a very heavy pecuniary cost for engravings, &c. has produced delay and disorder in the heretofore very regular times of publication, and also other important difficulties in our mechanical operations. But a small part of these disadvantages (the irregularity of publication,) has fallen upon our readers; and we hope and believe, that there is not one of them, whather he be farmer, civil engineer, mill-owner or mill-constructor, or merely a general reader, who will not find ten-fold remuneration in the information and instruction afforded by some portion of the contents of this treatise, which is now, for the first time, offered to the view of American readers.

The English copy of this work, which this first American edition gives in full, cost $6 in purchase money, as imported by our special order; and which is lower than it could be sold for, even if there were any other English copies in America, which is believed not to be the case. The subscribers to the Farmers' Register get this reprint, which gives every word, and every illustration, of the original work, (though, of course, in inferior style,) for 57 cents; that being the proportion of $5, equal to that which this treatise occupies of the bulk of one volume of the Farmers' Register.

For the Farmer's Register.

COMMERCIAL REPORT.

There is less demand for every description of imported goods this spring, than there has been in any previous one for many years. Small as the importations were, they are sacrificed at less than cost in the northern markets. Merchants from the south and west cannot make collections, and consequently have no means of purchasing. But even if collections could be made, the difference of exchange is so great, even where northern funds can be procured, as to deter men of business from carrying on their accustomed transactions.

In Virginia, 5 to 6 per cent. premium is paid on New York; and in New York, western paper is 20 to 30 per cent. below par. Sterling bills on New York are at 4 to 5½ per cent. premium; or, taking specie as the standard, 4 to 5 per cent. below par, Such a state of exchanges never before existed.

The south-western banks have become the principal purchasers or shippers of cotton, so that the merchants are almost completely thrown out of the business. The price of cotton is higher in the towns on the Mississippi and Alabama, than in New York. In the latter it is 7 to 10 cents; in the former, 8 to 11. The rate of freights is higher than at any time since the termination of the last war.

In our own markets, cotton is in fair demand at 8½ to 9½ cents. Not a vessel for Europe was in port during the month of March.

Tobacco is in demand at prices nearly or quite double those of last year, for the lower qualities, and 50 per cent. higher for the better sorts. The range of quotations is $3.50 to $12. This advance is owing to the diminished stocks in every market; the crops of Virginia having been small for the last two years.

Flour commands $7.25. Indian corn 70 cents. Of wheat, there is none brought to market.

The New York and Boston banks propose to resume specie payments next month. A convention of the banks generally, is to be held in New

York a few days hence, when the time for general resumption will be proposed; but that it will be at an early date is not expected. X.

April 7.

From Loudon's (London) Gardener's Magazine.

JOYCE'S NEW MODE OF HEATING.

Mr. Joyce, a commercial gardener at Camberwell, has recently made one of the most extraordinary inventions for producing heat, which have ever been given to the public. We question if any thing so remarkable has occurred, in a practical point of view, since the *invention* of gunpowder. Whether Mr. Joyce's stove will be so economical as to be adapted for general use, is a question that can only be satisfactorily determined by experience; but in the mean time it promises to be so; and, while it may be employed to heat churches, and all kinds of public and private buildings, ships, and the inside of carriages, Mr. Joyce thinks that the poorest cottager will find more comfort and economy in its use than in the common open fire-place. The invention not being, at the time we write, fully secured by patent, the details cannot be here given; but the result is, that heat is produced by an apparatus of very limited magnitude, and that it may be raised to any temperature that can be required, short of red heat, by combustion without the production of smoke. To most of our readers this will seem impossible; but the fact was placed beyond a doubt yesterday (Dec. 5), when one of Mr. Joyce's stoves, in action, was exhibited at a meeting of the Horticultural Society, in Regent Street, and examined by a great number of persons. The form of the stove in which the heat is generated, is that of an upright cylinder, from the conical apex of which a heated current of air escapes, and which current can be regulated at pleasure, or altogether stopped: but the chief source of heat is the radiation from the sides. Of course, the heat so generated may either be allowed to escape directly into the surrounding atmosphere, or be conveyed away in air-tubes, or by means of hot-water pipes, to a distance, or to any other apartment. If this invention answer the expectations which have been formed of it, it will effect a complete revolution in the mode of heating dwelling-houses throughout the world; because it is the only mode hitherto discovered by which heat can be produced by combustion, without any heat being lost. At present, whether a room is heated by an open fire-place, a close stove, steam pipes, or hot-water pipes, or by the introduction of a current of heated air from a cockle-stove, still a large proportion of heat necessarily escapes along with the smoke produced by the consumption of the fuel; but here not one particle of heat escapes, and the only care requisite in regard to the air of a room will be, to have a quantity of fresh air admitted proportionate to what is deteriorated by the combustion of the material employed in this new mode of heating, and by the persons breathing in the room. One advantage attending this invention is, that it is perfectly free from dust, and that the stove, when once charged and lighted, requires no attention whatever for from 20 to 30 hours, according to the charge. The convenience of such a mode of applying heat to rooms, without fire-places, closets of every description, whether of books, curiosities, or plants, &c., and, in short, to all enclosed places without chimneys, must be obvious. It is also adapted beyond all other inventions, for heating, with security from fire, ships, and for warming the inside of close carriages; and it might be taken under water in a diving bell, or into the atmosphere in a balloon. It is also admirably adapted for the purposes of French cookery. We shall not, however, enlarge farther on this invention, till we can explain to our readers what it is; and this Mr. Joyce has kindly promised to enable us to do at the very earliest moment after his patent is sealed. It is no small honor to the profession of gardener, that an invention of so much importance has been made by one of their number.—*Conductor.*

From the same.

Joyce's new stove and economical fuel.—Since we noticed this stove in our former number, p. 57, Mr. Joyce has taken out a patent, and has formed a partnership with Mr. Harper, of Cornhill. The stove has been exhibiting to the private friends of Messrs. Harper and Joyce, and to some literary and scientific men, three times a week; and it has been noticed in the 'Mechanic's Magazine' and the 'Literary Gazette,' for January 13, the only public journals, as far as we have observed, that have noticed it at all, except this Magazine. The following are extracts from the notices referred to:

Joyce's new stove "is in the form of a tall urn, having a pipe running entirely through the centre, with a cap or valve at the top, to regulate the draft. The urn is of thin bronze, and about two feet high, and eight inches in diameter. By the combustion of the fuel inside, the metal continues at a dull red heat, and so gives off the caloric to the surrounding air. The fuel is stated to be a vegetable substance; and one charge, in a stove of the above described dimensions, will burn for thirty hours, and will cost 6*d.* No smoke or effluvia are produced.—*Mechanic's Magazine*, January 13, 1838.

"*New mode of heating rooms.*—The puzzle which has been shown at the Jerusalem Coffee House, has set the wits of conjecturers at work upon the nature of the particular fuel, which, at so cheap a cost as a farthing an hour, is to warm a room. Of these conjectures we have heard two. The first is, that the gardener who discoved the fuel, which enabled him to keep up the fire whilst he slept, must have used old tanner's bark, as it was the only fuel accessible in a hot-house. The other is, that charcoal is the base, and lime employed to absorb the carbonic acid gas. Gipsies are in the habit of using the ashes of their fires, raked together in a heap, and sprinkled with lime. This will burn throughout the night, and no deteriorating gas is evolved to distress the sleepers in the gipsy tent."—*Literary Gazette*, January 13, 1838.

Mr. Joyce's patent is dated December 16, 1837; and the time for giving in the specification to the patent office, is limited to six months from that date. It will not be before our July number, therefore, that we can make our readers acquainted with the secret of the kind of fuel and the mode of burning; but, in the mean time, we may state that the conjecture as to the fuel consisting of charcoal and lime, which was made by Mr. Sylvester, the engineer, in the Horticultural Society's meeting-room, when the stove was first exhibited there, is by far the most plausible.

NEW CONDITIONS OF THE FARMERS' REGISTER.

The price reduced for the current and back volumes, and a further reduction proposed for the next.

I. The Farmers' Register is published in monthly numbers, of 64 large octavo pages each, and neatly covered, at $5 a year—payable in advance. Or three NEW subscribers, by sending their names and $10 at one time to the editor, free of postage, and of every other deduction from the amount, shall receive their copies *for one year*, for that sum, or at $3.34 for each. Purchasers of any three volumes (except Vol. I.) at one time, in like manner, shall have them for $10. [This reduction of price will be made on all suitable orders dated after April 20th.]

II. The risk of loss of payments for subscriptions, which have been properly committed to the mail, or to the hands of a postmaster, is assumed by the editor. ALL MAIL PAYMENTS MUST BE MADE IN NOTES, OR CHECKS, OF PAR VALUE IN VIRGINIA; and these, and all other letters, (except such as contain articles for publication,) must be POST PAID.

III. For all copies not received by mail, at the proper post offices, duplicates will be furnished to those subscribers who have complied with their own obligations; provided that the failure shall be notified through the postmaster, and within two months after the date of the miscarried copy.

IV. If a subscription is not directed to be discontinued before the first number of the next volume has been published, it will be taken as a continuance for another year. Subscriptions must commence with the beginning of some one volume, and will not be taken for less than a year's publication.

V. The mutual obligations of the publisher and subscriber, for the year, are fully incurred as soon as the first number of the volume is issued; and after that time, no discontinuance of a subscription will be permitted. Nor will a subscription be discontinued for any earlier notice, while any thing thereon remains due, unless at the option of the editor—(or in obedience to the regulations of the Editorial Convention, copied below.)

VI. Any five *old* subscribers, by paying for any current volume $20 *directly to the editor, at any one time before the issue of its second number, and without causing any charge for postage or agency*, shall be credited for their five copies for the year so paid for—thus reducing the price to $4 for each. This privilege, of course, ceases, for each volume, as soon as its 2nd number is issued—and no subscriber can use it, *who is indebted for a previous year*, unless his arrears are paid at the same time.

New Condition, offered for the 7th volume only.

Each subscriber to the Farmers' Register, for the present (6th) volume, (or any person who may hereafter subscribe for it,) who has paid for the same when the proposed arrangement shall take place, may, *by sending the names of three new subscribers*, for volume 7, at any one time previous to January 1, 1839, accompanied by a POST-PAID *current bank note, or check for ten dollars*, shall have credit for his own payment for volume 7, in addition to that for the three new subscribers; the *four copies, of that volume only*, being thus supplied for ten dollars.*

General Regulations adopted by the Editorial Convention.

The following resolutions of the Editorial Convention of Virginia, will hereafter form part of the conditions of the Farmers' Register, and will be strictly observed.

1. "All subscriptions shall hereafter be considered as incurred and due in advance, and for a year's publication, unless specially ordered for a shorter time, and paid for in advance for that shorter time, when so ordered.

2. "No publication shall be sent to the order of any new and unknown subscriber, unless paid for in advance, or satisfactory reference be made to some known and accessible person in regard to the subscriber or his payment. But, in case of an order for a publication, without payment, from a new subscriber who is unacquainted with the conditions, a single number may be sent, containing, or accompanied by, a copy of this regulation.

3. "The names of all subscribers, whose ability to pay may be unknown to the publisher, and who may remain indebted on open account at the end of two years, from the time when the advanced payment was due, shall be erased from the list of subscribers." [*Resolutions of the Editorial Convention of Va.*

Address— EDMUND RUFFIN,

April 12th, 1838. *Editor of Farmers' Register, Petersburg, Va.*

* For reasons which will be hereafter stated, it is designed to conclude the present volume on December 31, 1838—by issuing two numbers in advance of the regular times of publication. Therefore, the next and succeeding volumes will begin with the year. This change of time will be convenient in many respects, and is especially required for an agricultural journal.

TO THE FRIENDS AND SUPPORTERS OF THE FARMERS' REGISTER.

The attention of every subscriber and friend to the Farmers' Register, is requested to the new alterations, and temporary additional article, in the general conditions of publication; and as many as can, with convenience, avail of the advantages offered by the latter, are requested to do so, not only for the benefit of the individuals concerned, but for the purpose of extending the circulation and the influence of the work, and thereby greatly increasing its useful operation. It is believed that almost every subscriber now on the list, might, with the inducements thus offered, obtain at least three new subscribers among his neighbors; and those who deem and declare the present and previous operation of the Farmer's Register to be highly beneficial to the improvement of agriculture, have still stronger motives to urge to the effort; and they can well estimate the increased benefit to the public, thus to be obtained by a quadrupled publication and distribution of the work. We should rejoice at reaching such a general result, even though the nett profits were not to be increased in the least thereby.

The expenses of printing, however, decrease still

more rapidly than the amount of sales of a publication increases by a greater demand; and therefore, we shall not lose any thing by any extent of the use of the privilege now offered. And if this abatement of price should finally serve to give a list of subscribers increased four-fold, then that which is now offered as an experiment of a temporary measure, of special and limited application, may safely be made permanent and general, by reducing the price of the Farmers' Register to a lower rate than any publication, of worth or character, has ever yet been offered in the southern states.

If by the legislative action of any state, or of any public spirited association of individuals, a sufficiently large sale of this work was guarantied to the publisher, the price might be reduced, for that state, to but a little more than double that of as much blank paper; and when the sales were once made equal to so large a supply, of this or any really useful agricultural journal, the demand would doubtless continue, at so low a price; and the sustaining aid of public patronage, as security against loss, would no longer be required. It is doubtful whether any other mode of extending the knowledge, and the improvement, of agriculture, would be so effectual and so cheap. But this, or any other legislative aid to agricultural instruction and improvement, is out of the question, at least in Virginia; and therefore the experiment now proposed, appeals to individual interests, and has regard to the action and patriotism of individuals only.

It is indispensable for those who mean to benefit the publication and themselves, as well as the agricultural interest in general, by making use of this offered privilege, that they should do so before the close of volume 6; as the increase of number of the copies of volume 7 must be then determined on, and cannot afterwards be altered. It is to allow full time for the usual slow movements of subscribers that this early notification is made.

Should this offer prove acceptable to a large number of our present subscribers, it will have other very beneficial results, in causing payments to be made prompt and certain, and relieving the publication of the present heavy expenses of commissions paid to collectors, postage on remittances, and most of the many and total losses of debts for subscriptions. These several items, in distant places, and where the subscribers are few and widely dispersed, consume nearly the whole profit of those subscribers, similarly located, who are both punctual and generous patrons.

It is hoped th t no person who may choose to avail himself of the proposed reduction of price, will forget that the very foundation on which it rests, and by which alone it can be afforded, is that, in relation to all such subscriptions, the publication is to be entirely relieved of all expenses and losses of postage, exchange of uncurrent money, und every other charge, save the furnishing the work according to the 'General Conditions' of the publication. According to those conditions, the loss of money remitted by mail, in these as in other cases, is still at the risk of the publisher, and all numbers of the work, lost by mail, are to be re-supplied—both losses being duly authenticated, as required in the general conditions annexed.

Any subscriber who may have paid in advance for volume 7, may still have the benefit offered above, of four subscriptions for $10, except that his second payment, so included, will be placed to his credit either for another copy of volume 7, for some other named new subscriber, or for any other back volume (except vol. 1,) for himself, as he may choose and direct, at the time of sending the order.

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